TECHNOLOGY DEPARTMENT

Gas Journal

Vol. 254. 100th Year. LONDON, APRIL 21, 1948. No. 4429. Price 1/-

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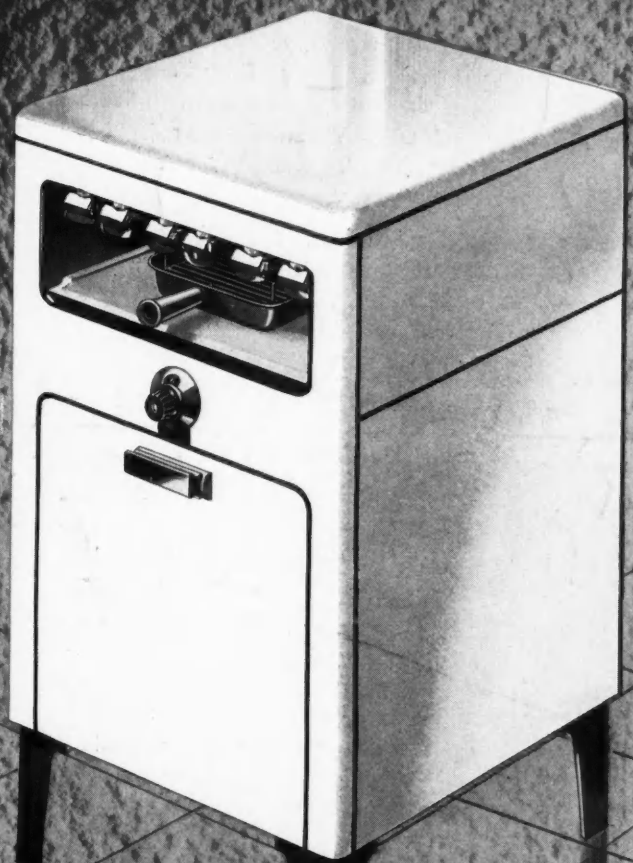
PIONEERS OF CLEAN LINE COOKERS



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"HICKS" TYPE.
For medium pressures up to about 5 lb. per square inch.

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Access to all working parts for cleaning while valve is under pressure.

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The valve is of the parallel slide type and cannot jam.

The two doors are separate and held against the faces by means of springs. The faces are, therefore, cleaned each time the valve is opened or closed.

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Full clear bore.

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For high pressures up to 100 lb. per square inch.

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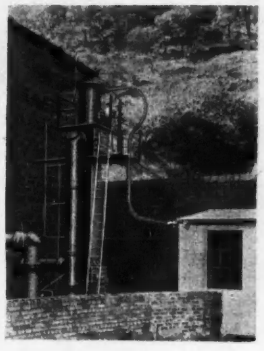

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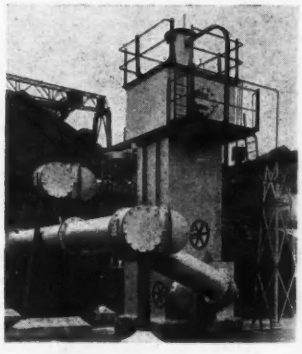

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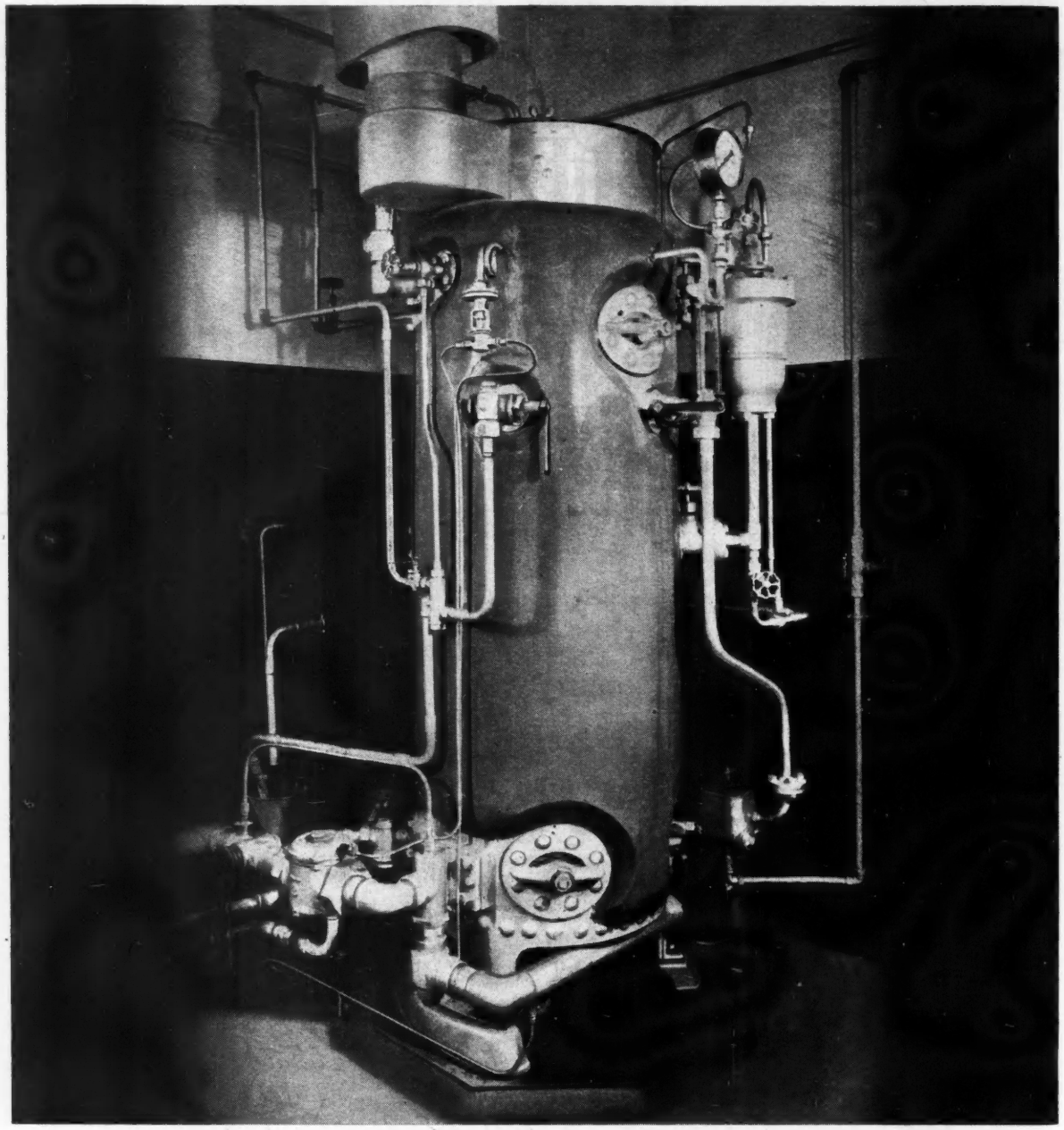

HANDSOME IS AS HANDSOME DOES

A neat and efficient installation — a Cochran "Sinuflo" Town's Gas-Fired Boiler 1' 9" dia. × 6' 6" high × 120 lbs./sq. in. working pressure for a duty of 190 lbs. of steam per hour from feed at 60°F, supplying steam to a disinfestor and sterilising apparatus at a London Hospital. Fitted with "Thermofeed" regulator, steam pressure regulator and flame failure thermostat.

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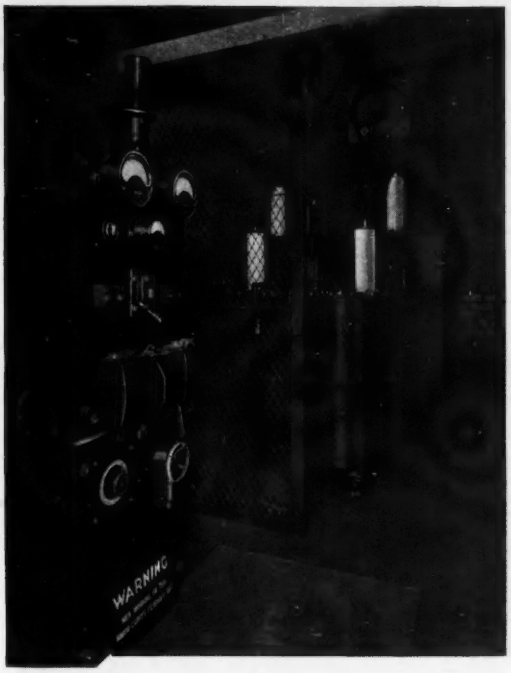
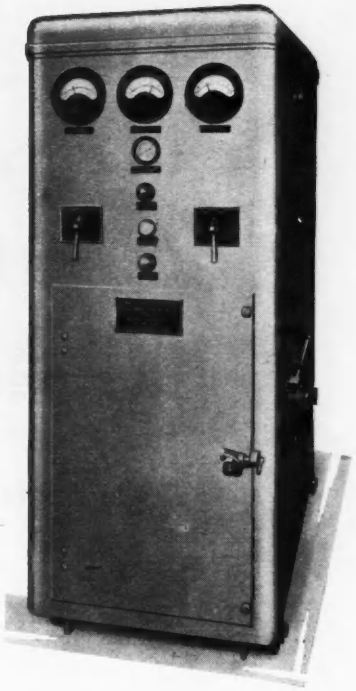
20 years' progress

IN ELECTROSTATIC PRECIPITATION



1928—Pioneers

View in rectifier house, showing cubicle and instrument panel, transformer and static rectifier of the pioneer Simon-Carves static rectifier H.T. equipment for electrostatic precipitation - the first of its kind in Great Britain.



1948—Leaders

Simon-Carves-Ferranti shock-proof static rectifier H.T. equipment, as used in modern precipitation plants. More than 75 of these sets have been ordered since their introduction.

The photograph shows a 33KV 60 m/a set.

SIMON-CARVES LIMITED

CHEADLE HEATH STOCKPORT

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. . . but it's the greater **strength** of **Canalloy** which establishes its permanent use in gas appliance production

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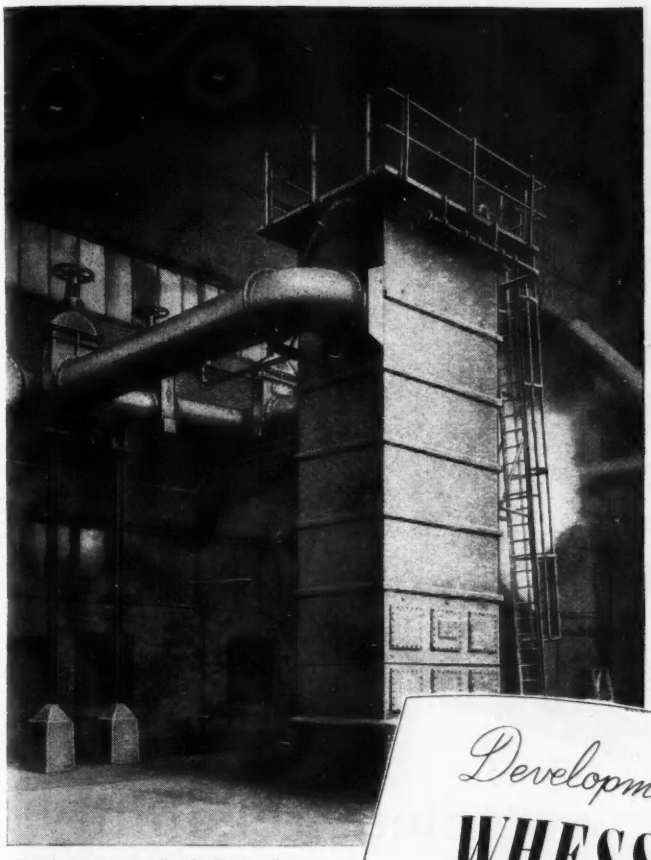
CANALLOY —— EXCLUSIVE TO CANNON GAS APPLIANCES



Condenser installed for the Preston Gas Company, capacity 6.0 Million cu. ft. per day vertical retort gas.

Development in **CONDENSER DESIGN**

WHESSOE MULTI-PASS VERTICAL TUBE CONDENSER

Whessoe have played an important part in the development of high efficiency, rectangular, multi-pass, vertical water-tube gas condensers, now widely employed on account of the ease of maintenance together with minimum surface requirement and water consumption. A feature of the Whessoe design is the means employed for flushing the gas side of the water tubes for the removal of deposits.

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Comet Igniters.

The Mk IX Comet here shown attached to the controller is a simple, robust appliance designed to give years of trouble-free service The proved saving in gas consumption is up to 1,500 cu. ft. per lamp per annum.

Controller. The type 3A/UNI Controller, which is being increasingly accepted as the standard for such equipment throughout the world, provides, in combination with the Comet Igniter, the last word in modern automatic control.

B48
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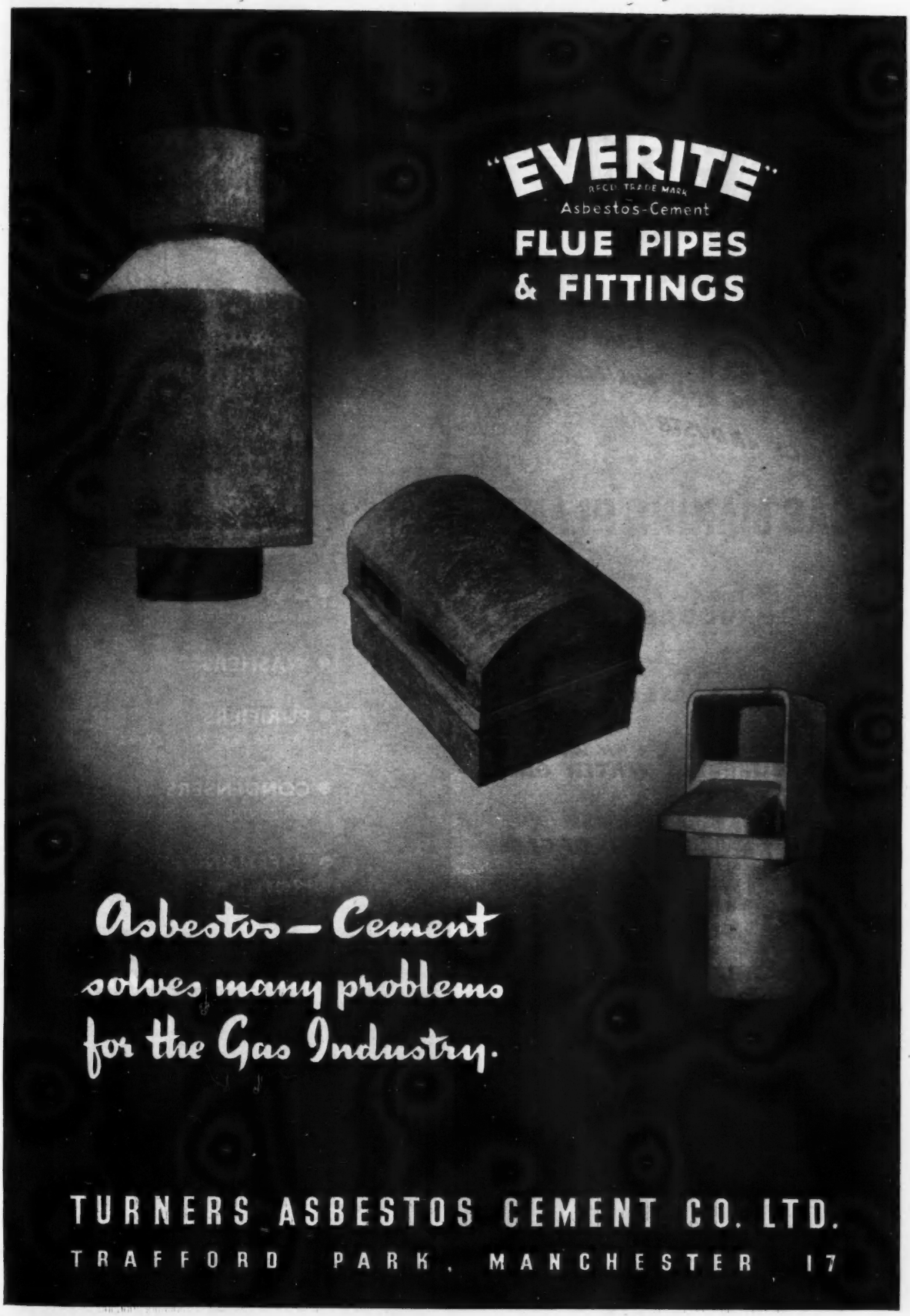
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solves many problems
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FOR RETORT & OVEN HEATING
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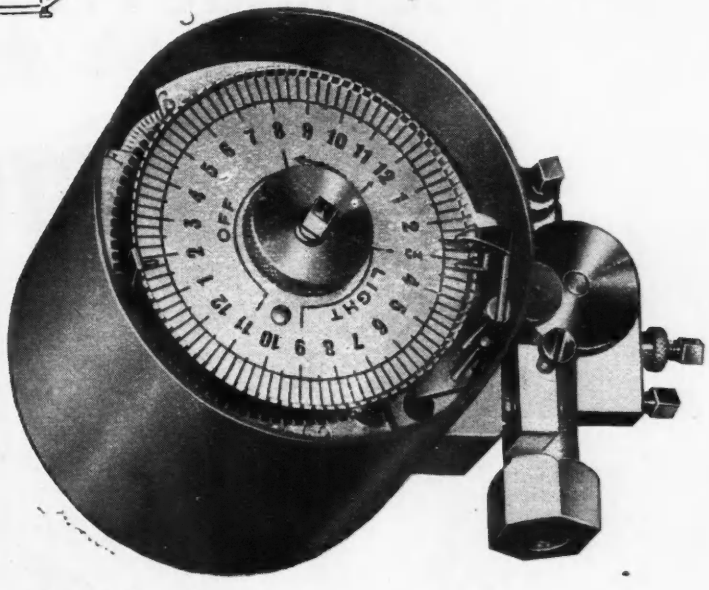

Gas is perfectly controlled with the Kingsland, for the Kingsland gives instantaneous ignition—with gradual extinction of the by-pass. At "off" times it gives that slow extinction of the main burner (and ignition of the by-pass) which makes for economy.

★ *No "MISSES" with the Kingsland.*

★ *No broken glass as a result of sudden extinction in winter.*

★ *No danger of sudden darkness for motorists, driving along country roads at midnight.*

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"The clock that sets with a click"

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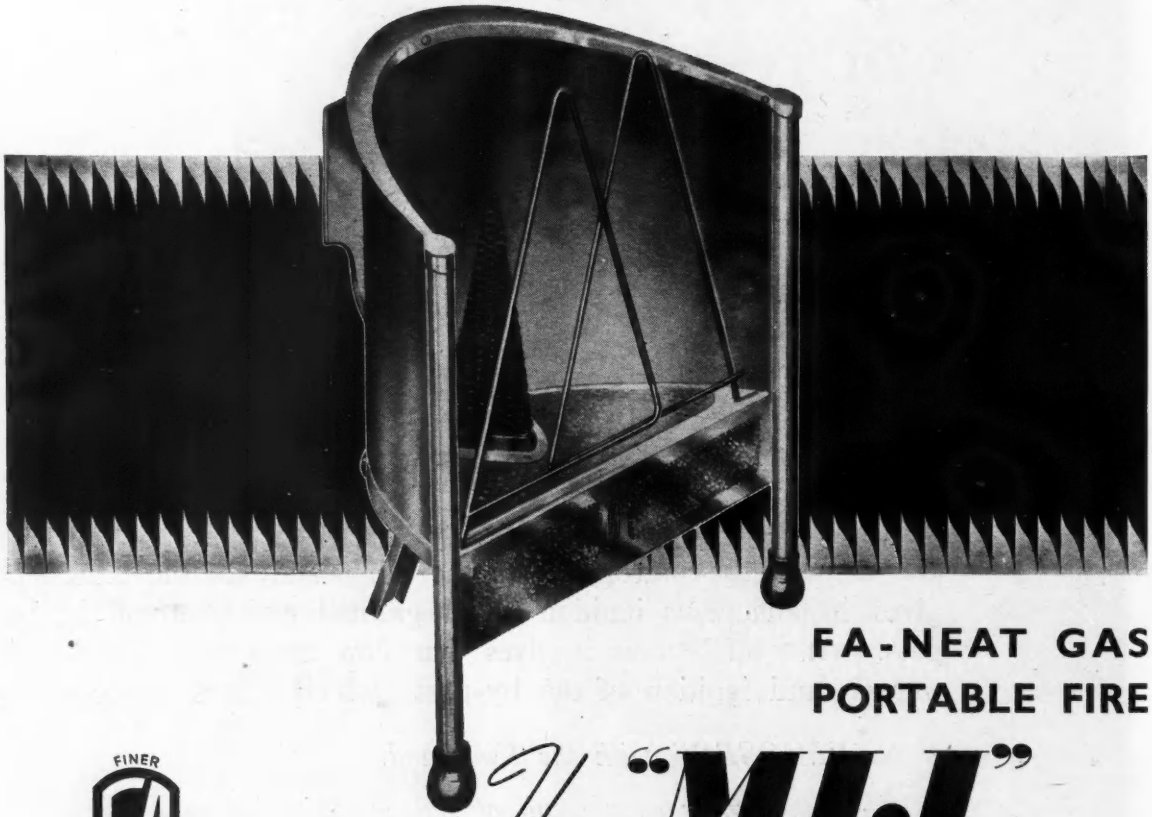
the lowest consumption, high radiant efficiency gas fire yet made...



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The "MIJ"

FINER FA APPLIANCES

Consumption 6½-7 cubic feet of gas per hour at $\frac{20''}{10}$ pressure. 3250-3500 B. Th. U. per hour.

A high radiant efficiency is obtained by the scientifically shaped radiant which, by its design, carefully balances mass : heat input : mechanical strength.

The burner and chromium-plated reflector are made of brass.

Three Neat Gas Jets are used.

The low cost of this fire is achieved by extremely simple construction.

"Designed for Economy without Austerity"

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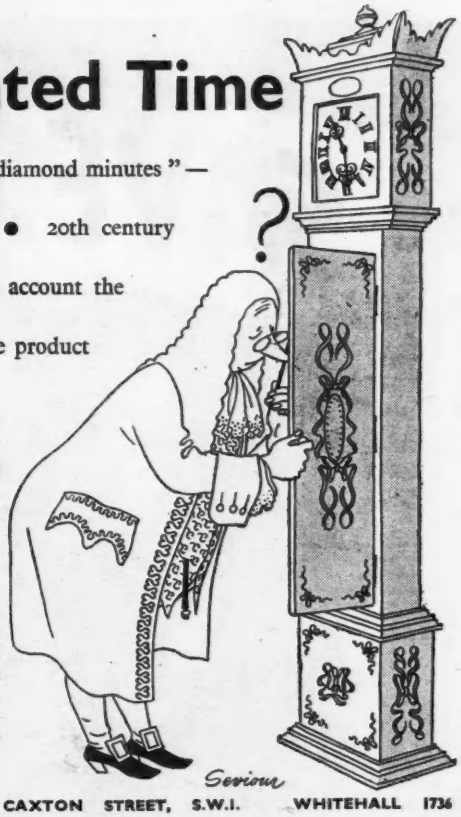
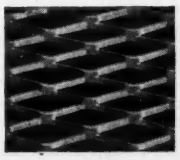
"**LOST,** yesterday . . . . . two golden hours, each set with sixty diamond minutes" — so wrote Sir Horace Mann, the 18th century letter-writer • 20th century planners and builders are ahead of time ; they are turning to account the remarkable adaptability★ of "Expamet" Expanded Metal — the product with countless applications.



EXPAMET

EXPANDED METAL



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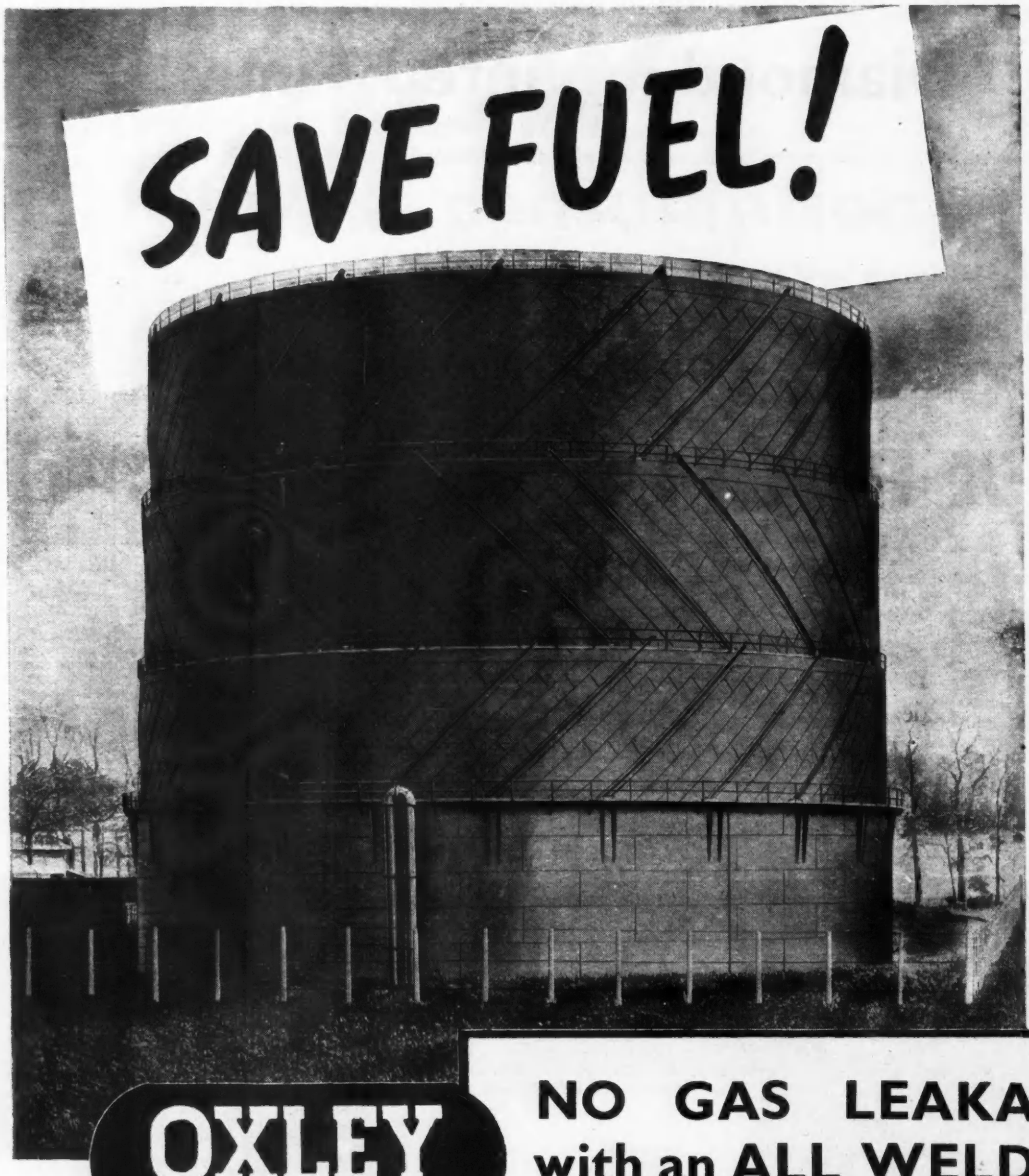

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Tank—147 ft. 6 in. dia. by 34 ft. 6 in. deep.
Outer lift—145 ft. dia. by 33 ft. 6 in. deep.
Middle lift—142 ft. 3 in. dia. by 33 ft. 6 in. deep
Inner lift—139 ft. 6 in. dia. by 33 ft. 6 in. deep.
CAPACITY: 1¼ MILLION CUBIC FEET.
Internal rain water drainage can be fitted to crown if desired.

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The really remarkable savings effected by gas undertakings who have installed Oxley all-welded spiral-guided gasholders, provide ample proof of the advantages of Oxley design and construction. Today, apart from the importance of saving fuel, steel, too, must be considered and here the Oxley design can show greater strength combined with a smaller weight of steel.

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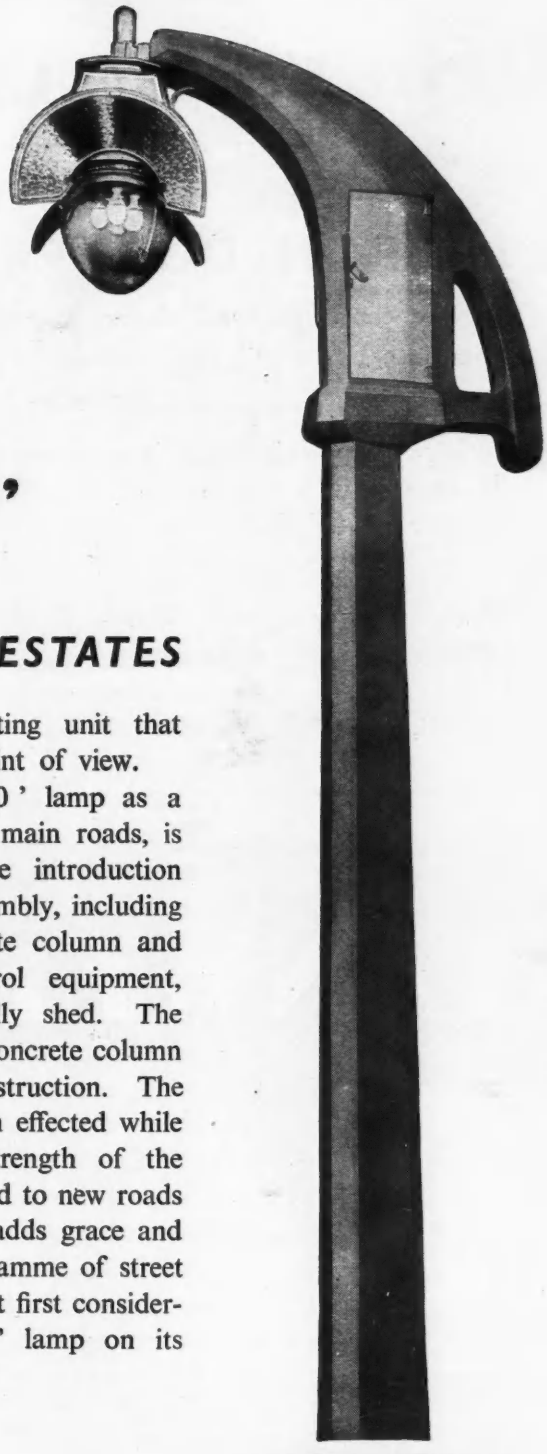

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Here is a modern gas street lighting unit that challenges comparison from every point of view. The inherent efficiency of the ' 8000 ' lamp as a means of illumination for all except main roads, is rapidly becoming known. With the introduction of this lighting unit as a complete assembly, including tastefully designed Sugg C-U concrete column and bracket with totally enclosed control equipment, any legacy of ugliness is now finally shed. The mature experience of both lamp and concrete column manufacturers is embodied in the construction. The housing of the control gear has been effected while still retaining the constructional strength of the bracket fixing. It is particularly suited to new roads and housing developments, where it adds grace and dignity to the layout. No new programme of street lighting should be put through without first considering the claims of the Sugg ' 8000 ' lamp on its new Type G. mounting.

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"MICRON" DUST PRECIPITATORS

provide thorough precipitation of coal dust, coke dust, flint and silica dust, boiler grit, etc., from air or gas in any process or industry

Where dry precipitation is necessary the MICRON Precipitator is especially favoured, since it combines high efficiency with selective precipitation, and particles larger than 10 microns are completely eliminated.

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ERITH, KENT London Office: **MAGNET HOUSE, KINGSWAY, W.C.2**

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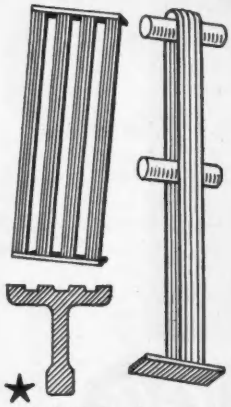

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- Every bar welded . . . no rivets to work loose
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Use it for all surfaces of gasholders and similar plant, and you can be sure of complete protection.

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WITH AUTOMATIC COMPENSATION FOR CHANGES IN GAS VOLUME FACTOR

THE SIMMANCE PATENT GRAVITOMETER

CAN BE CHECKED AT ALL POINTS OF THE SCALE BY "DEAD WEIGHT"

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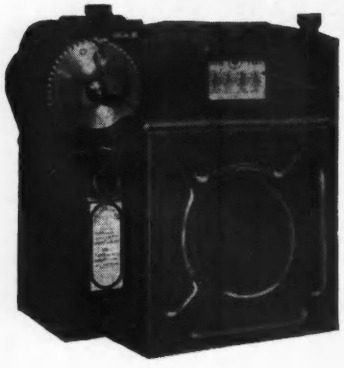

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Although our leathers carry the normal guarantee, meters returned from war-damaged premises for reconditioning have shown that our diaphragms in many cases are still completely accurate after being in use as long as 35 years.

Products of the "all-gas-powered works"

THE DIAPHRAGM & GENERAL LEATHER CO. LTD.
FRANKLIN ROAD WORKS · PORTSLADE · SUSSEX

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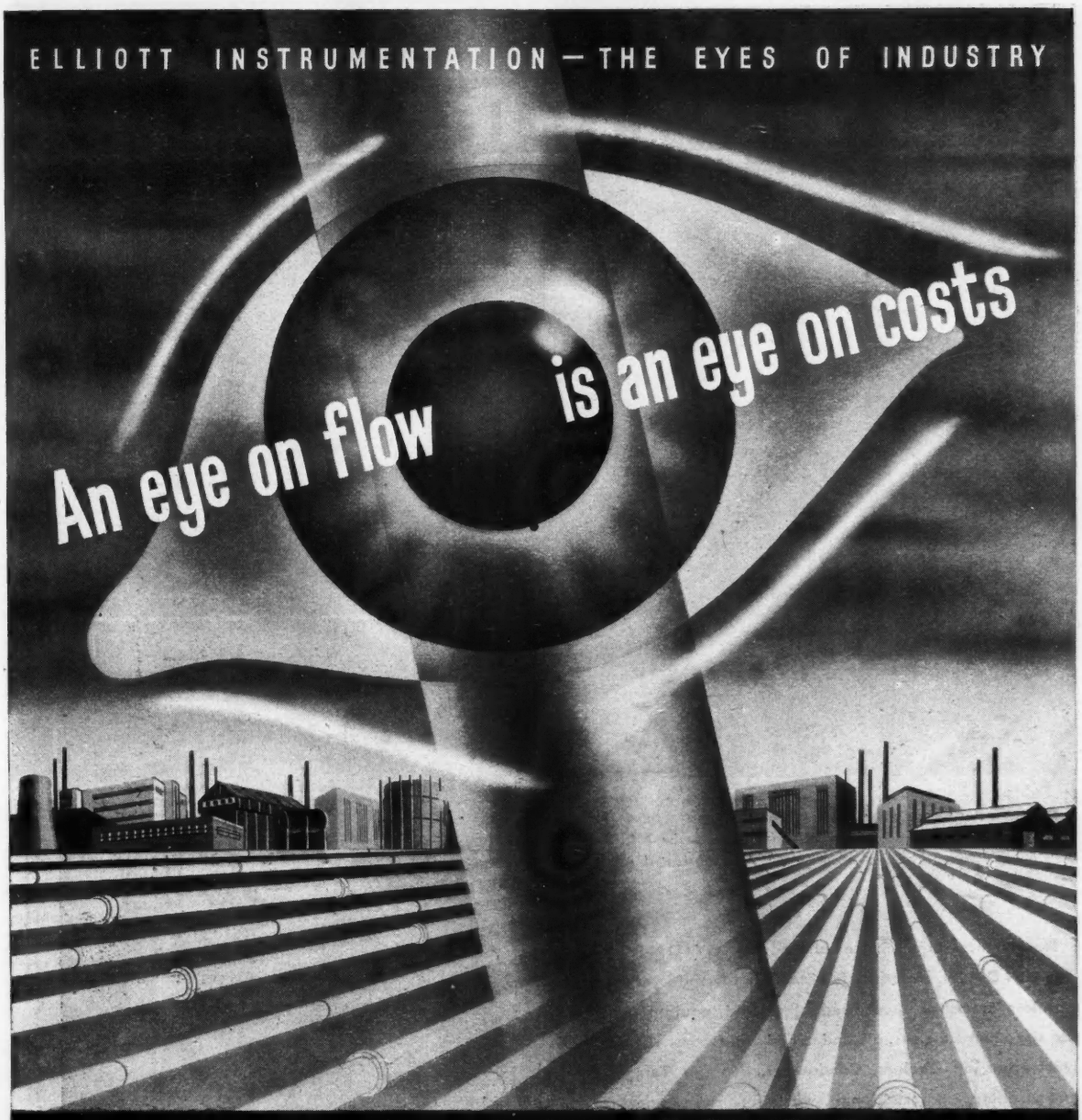

Accurate measurement and control of flow – gas, steam, liquids, air – is a vital factor in industrial economics. Elliott Flowmeters provide increased quality by closer supervision of processes, save labour costs with the aid of automatic control equipment, trace waste by checking quantities and facilitate correct charging in distribution schemes. In every case the capital cost of Elliott Flowmeters is repaid in a short time by the economies they make possible.

ELLIOTT FLOWMETERS

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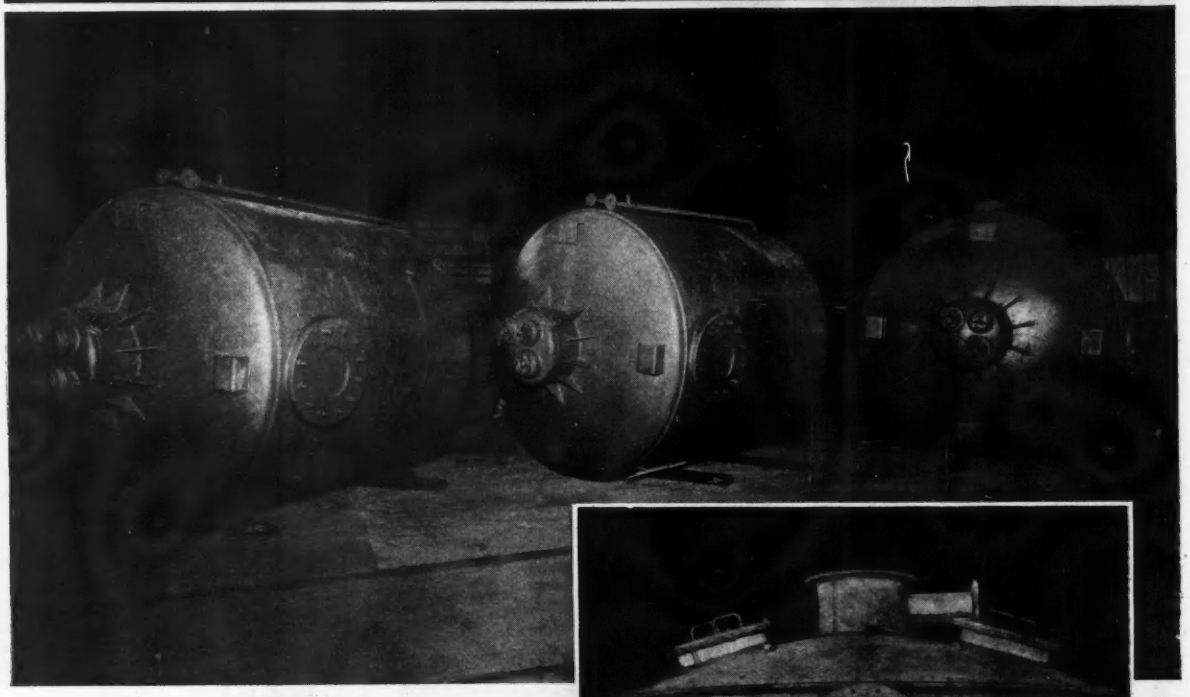
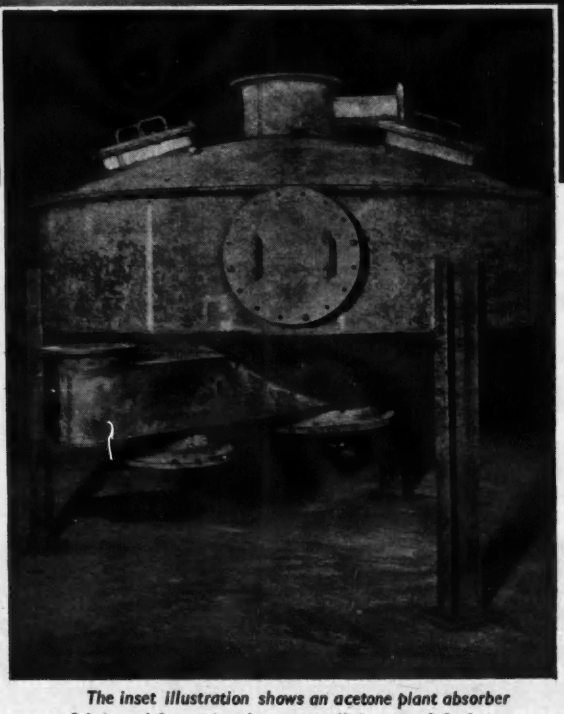
FABRICATION IN STEEL



The upper illustration shows a typical WIDNES job — fabricated mild steel viscose kettles 7 ft. 1 in. diameter by 7 ft. deep on the straight, part of an order for 25, fabricated in accordance with BSS 487.

* * *

The engineering service offered by WIDNES FOUNDRY includes fabrication in mild and stainless steels of specialised plant and equipment for the chemical, gas, oil and allied industries. The fabrication of Coolers, Condensers, Storage Tanks and similar constructional work is the logical parallel to production of special purpose castings for the industries mentioned. In foundry work and in fabrication in steel WIDNES offer a skilful, comprehensive service to industry.



The inset illustration shows an acetone plant absorber fabricated from ¾ in. plate; overall diameter 9 ft. 6 ins., weighing 4½ tons.

WIDNES

FOUNDRY & ENGINEERING

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British Made

OVER 50 YEARS

pride in branding malleable iron pipe fittings **GF** has been something to live up to, and this ideal not only put **GF** "at the top of the tree" but should keep them there.

Over one hundred million cubic feet of Bedford Town Gas is used annually in the manufacture of **GF** Malleable Iron Pipe Fittings—they are made BY gas FOR gas.

FOR HOUSES

Steel tubes for gas distribution require **GF** connections for sound leak-proof joints.

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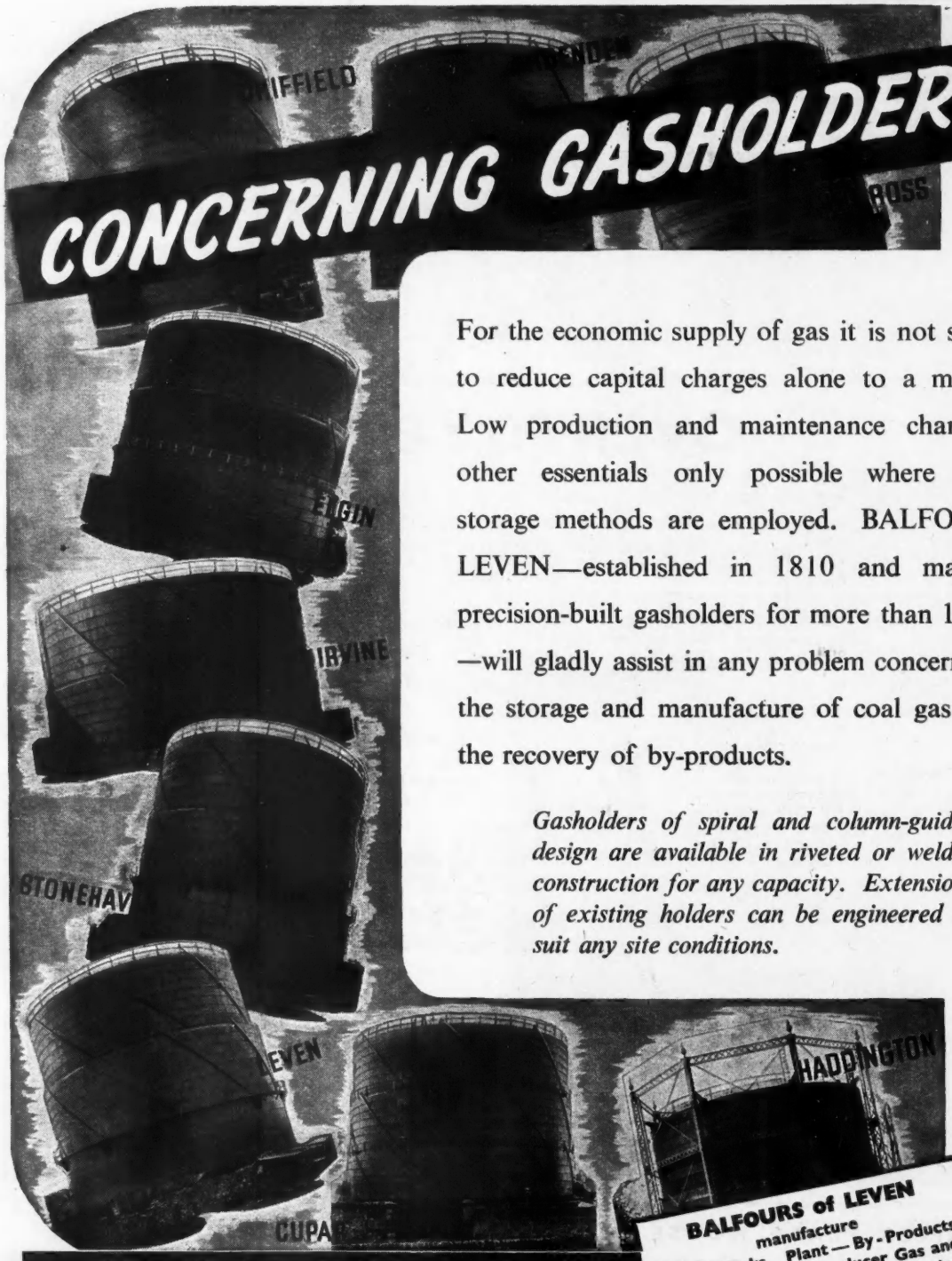
Warehouses : LONDON : MANCHESTER : GLASGOW : BELFAST

Made at Britannia Works, Bedford



CONCERNING GASHOLDERS

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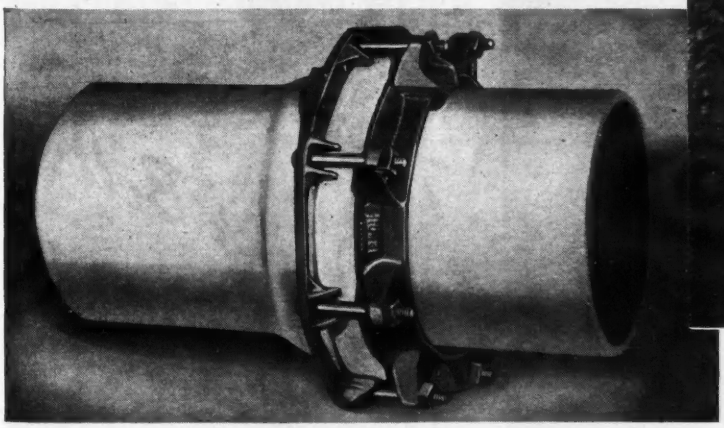

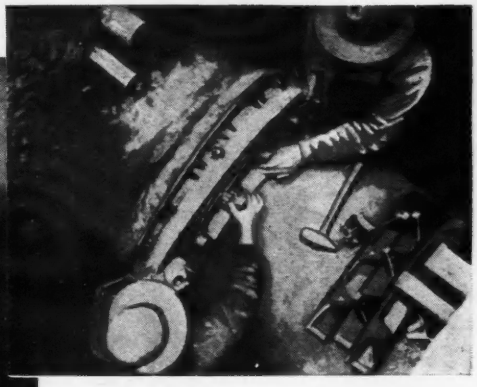

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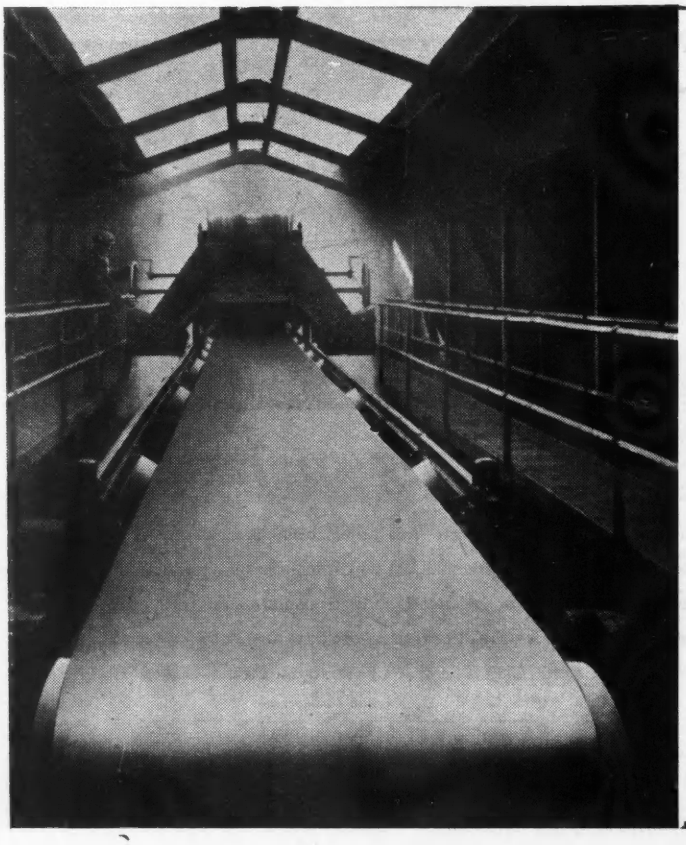

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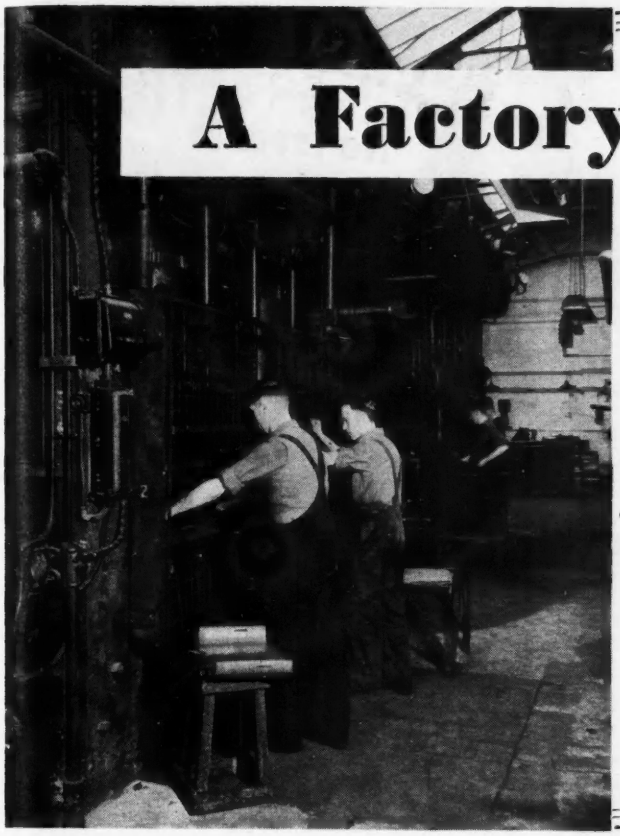

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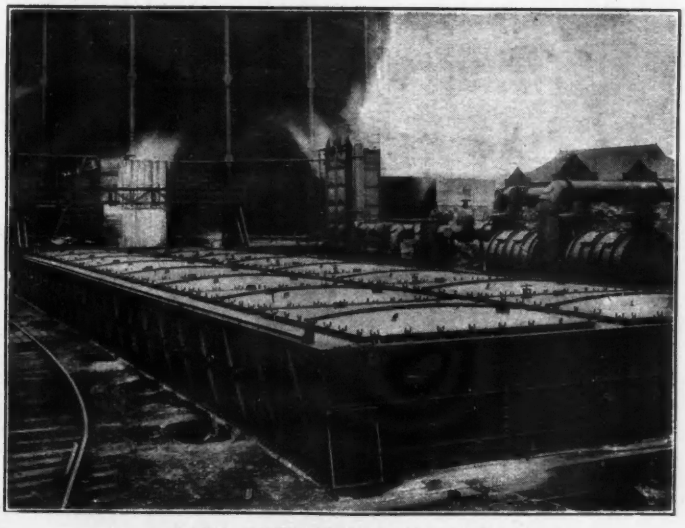

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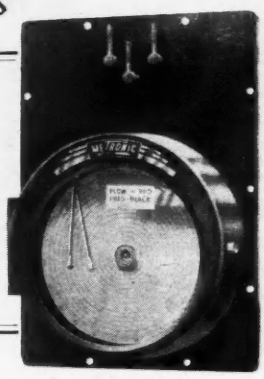

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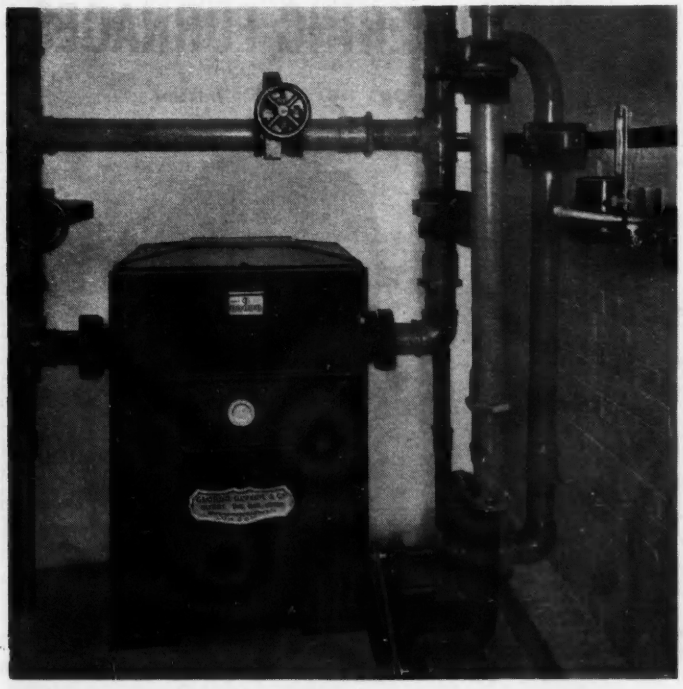

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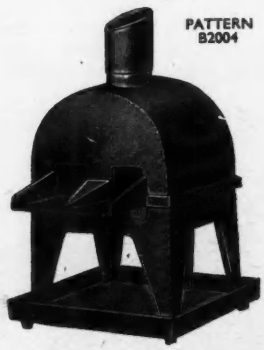

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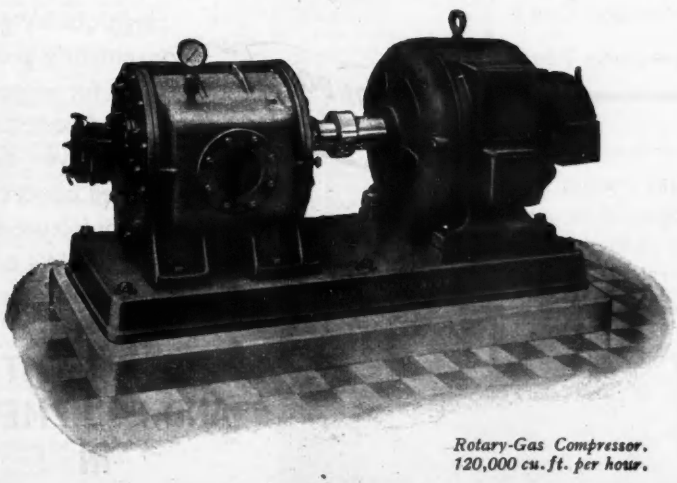

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INDEX TO "JOURNAL" ADVERTISERS

	PAGE
A	
A.C.E. Machinery, Ltd.	
Acme Wringers, Ltd.	
Abbott, Birks & Co., Ltd.	
Accurate Recording Instrument Co.	
Albright & Wilson, Ltd.	
Alder & Mackay, Ltd.	168
Ascot Gas Water Heaters, Ltd.	
Ashmore, Benson, Pease & Co. Ltd.	120
Ashworth & Parker, Ltd.	
Aspinall's (Paints), Ltd.	S5
Automatic Telephone & Electric Co., Ltd.	
Automotive Products, Ltd.	
Averill, C. R., Ltd.	
B	
Bagnall, W. G., Ltd.	
Bale & Church, Ltd.	S5
Balfour, Henry, & Co., Ltd	132
Bell's Asbestos & Engineering, Ltd.	133
Belliman Hangars, Ltd.	S5
Benham & Sons, Ltd.	
Bitulac, Ltd.	127
Boydell, E., & Co., Ltd.	
Braddock, J. & J.	
Bratt Colbran, Ltd.	
Bray, George, & Co., Ltd.	
Bristol's Instrument Co., Ltd.	
British Fittings Co. (Hendon), Ltd.	
British Flint & Cerium Manufacturers, Ltd.	
British, Foreign & Colonial Automatic Light Controlling Co., Ltd.	
British Furnaces, Ltd.	
British Gas Council	
British Gas Purifying Materials Co.	
British Industries Fair	142
British Thomson Houston Co., Ltd.	
British Vacuum Cleaner & Engineering Co., Ltd.	S3
Broadbent, J. C., & Co., Ltd.	S5
Broadbent, Thomas, & Sons, Ltd.	
Brockhouse Heater Co., Ltd.	
Broom & Wade, Ltd.	Cover IV
Brotherhood, Peter, Ltd.	
Bugden, Thos., & Co.	
C	
Cannon Iron Foundries, Ltd.	116
Cannon Iron Foundries, Ltd. (Canalloy Tubing and Fittings)	
Carrington, Tom, & Co., Ltd.	170
Cellactite & British Uralite, Ltd.	
Chance Bros., Ltd.	S1
Chaseside Engineering Co., Ltd.	
Chemical Engineering & Wilton's Patent Furnace Co., Ltd.	
Cinema-Television, Ltd.	
"Citizen"	
Clapham Bros., Ltd.	
Clayton, Son & Co., Ltd.	S8
Clough (Croydon), Ltd.	
Cochran & Co. (Annan), Ltd.	114
Cochrane & Co. (Shettleston) Ltd.	
Collins, Thomas, & Co., Ltd.	
Concrete Proofing Co., Ltd.	
Connell, James N.	S4
Consolidated Pneumatic Tool Co., Ltd.	135
Corner, G., & Co., Ltd.	
Cowper Penfold & Co., Ltd.	
Cox & Danks Ltd.	134
Crane, Ltd.	
Crone & Taylor, Ltd.	
Crossley, Bros.	
Crow, Fred B.	140
Curtis, Algernon Lewin	S2
Cutler, Samuel, & Sons, Ltd.	
Cuxson, Gerrard & Co., Ltd.	S2
D	
Danks, of Netherton, Ltd.	
De la Rue Gas Development Ltd.	145
Dempster, R. & J., Ltd.	113
Dempster, Robert, & Sons, Ltd.	162, S6
Derbyshire Silica Firebrick Co., Ltd.	
Devonarc Welding Works	
Dewrance & Co., Ltd.	
Diaphragm & General Leather Co., Ltd.	128
Dick, R. & J., Ltd.	
Donkin (The Bryan) Co., Ltd.	Cover II
Douglas, William, & Sons, Ltd.	
Drag Scraper & Engineering Co., Ltd.	
Drakes, Ltd.	
Drew, H. B., Ltd.	S1
Dunlop Rubber Co., Ltd. (General Rubber Goods Division)	136
Durasteel Roofs	
E	
Edgar, William, & Sons, Ltd.	
Electrofio Meters Co., Ltd.	
Electrolux, Ltd.	
Elliott Bros. (London), Ltd.	129
Ether, Ltd.	
Evershed & Vignoles	
Ewart Chainbelt Co., Ltd.	
Ewart & Sons, Ltd	
Expanded Metal Company Ltd.	123
F	
Falk, Stadelmann Co., Ltd.	137
Federated Foundries Ltd.	138
"Field's Analysis"	S5
Filtrators, Ltd.	
Firth, Blakeley, Sons & Co., Ltd.	
Flavel, S., & Co., Ltd.	
Fluxite, Ltd.	
Foster Transformers & Switchgear Ltd.	
Four Oaks Spraying Machine Co., Ltd.	
Fraser & Chalmers, Engineering Works.	126
Friedman, Athill, Ltd.	122
G	
Gas Meter Co., Ltd.	121
Gas Purification & Chemical Co., Ltd.	S5
General Gas Appliances, Ltd.	
Gibbons Bros., Ltd.	
Gibbons (Dudley), Ltd.	
Gills Pressure Castings	
Glover, George, & Co., Ltd.	139
Glover, Thomas, & Co., Ltd.	146
Goodall Clayton & Co., Ltd.	S3
Goodyear Mechanical Goods	
Grant & West, Ltd.	S6
Grant, David, & Co., Ltd.	
Green & Boulding, Ltd.	S5
Greening, N., & Sons, Ltd.	
H	
Hamilton, A. H., & Co., Ltd	
Hannan & Buchanan	
Hardman & Holden, Ltd.	
Harris & Pearson, Ltd.	
Harrisons (London), Ltd.	S5
Harvey, G. A., & Co. (London), Ltd.	
Heat & Air Systems, Ltd.	
Helliwells, Ltd.	
Hewitt Construction Co., Ltd.	135
Hilmor, Ltd.	
Holden & Brooke, Ltd.	
Holmes, W. C., & Co., Ltd.	S7
Horsley Bridge & Thomas Piggott, Ltd.	
Horstmann Gear Co., Ltd.	118
Humphreys & Glasgow, Ltd.	144
Hyde, Silas, Ltd.	
I	
I.C.I. Metals, Ltd.	
Incandescent Heat & Co., Ltd.	
Ingham, John.	
International Coin Counting Machine Co., Ltd.	
International Combustion	
J	
Jeavons, E. E., & Co., Ltd.	
Jeavons Engineering Co.	
Jenkins, W. J., & Co., Ltd.	
Jobling, James A., & Co., Ltd.	
K	
Keay, E. C. & J., Ltd.	137
Keith Blackman, Ltd.	S8
Key Engineering Co., Ltd.	
King, George W., Ltd.	S1
King, Walter, Ltd.	170, S5
Kings Patent Agency, Ltd.	
Kirkham Hulett & Chandler, Ltd.	136
Kleenoff Co.	
Klinger, Richard, Ltd.	
L	
LaFarge Aluminous Cement Co., Ltd.	
Laidlaw, R., & Son, Ltd.	
Lamont, James H., & Co., Ltd.	
Lancashire Dynamo & Crypto, Ltd.	
Le Bas Tube Co., Ltd.	131
Leeds X.L. Fire Cement Co.	
Lomax & Smith, Ltd.	S2
London Electric Firm, Ltd.	
London Nameplate Manufacturing Co., Ltd.	
London Welding Co., Ltd.	123
M	
MacPherson, Donald, & Co., Ltd.	
Main, R. & A., Ltd.	165
Main Water Heaters, Ltd	
Mavitta Drafting Machines, Ltd.	
Meltham Silica Firebrick Co., Ltd.	
Metronic Instrument Co., Ltd.	139
Metropolitan Leather Co., Ltd.	
Mewburn, Ellis, & Co.	S5
Midland Bank, Ltd.	
Milnes Meters, Ltd.	
Ministry of Fuel	
Ministry of Labour	
Mitchell, H., & Co.	140
Morris Commercial Cars, Ltd.	
Mors Moler	
N	
National Enamels, Ltd.	
National Gas Water Heater Co., Ltd.	
National Savings Committee	
New Bowson Coal Co., Ltd.	
Newton Chambers & Co., Ltd.	
Niagara Screens (G.B.), Ltd.	
Nicholson & West, Ltd.	S1
North British Rubber Co., Ltd.	
Northern Metal Trading Co. Ltd	
Northern Pump & Equipment Co., Ltd.	
O	
Oxley Engineering Co., Ltd.	124
P	
Parkinson & Cowan (Gas Meters), Ltd.	146
Parkinson Stove Co., Ltd.	Cover I
Pass, E., & Co., Ltd.	
Peckett & Sons, Ltd.	S3
Peebles & Co., Ltd.	
Perfecta Gas Appliances, Ltd	145
Power Gas Corporation Ltd.	120
Powers-Samas Accounting Machines, Ltd.	
Press, William, & Son, Ltd.	
Pulsometer Engineering Co., Ltd.	
R	
Radiant Heating, Ltd.	
Radiation, Ltd.	166, 167
Ransomes, Sims & Jefferies	
Rawlplug Co., Ltd.	135
Reavell & Co., Ltd.	141
Renfrew Foundries, Ltd.	
Renwick, Wilton & Dobson, Ltd.	
Roneo, Ltd.	
Rose, Sir W. A.	
Royal Institute of Chemistry	
Rubber Asbestos Fibre Ltd.	
Russell, R., & Sons, Ltd.	S2
S	
Salter, T. E., Ltd.	
Sawer & Purves	
Scottish Non-Ferrous Tube Industries, Ltd.	
Sentinel (Shrewsbury) Ltd.	
Siebe Gorman & Co., Ltd.	
Sigma Instrument Co., Ltd.	
Sisson, W., & Co., Ltd	
Simon-Carves, Ltd.	115
Slingsby, W., & Co., Ltd.	
Smith Meters Ltd.	
Spencer Bonecourt, Ltd.	
Spencer (Melksham), Ltd.	
Sperryn & Co., Ltd.	
Stanton Ironworks Co. Ltd.	138
Stanweld Engineering Co., Ltd.	126
Staveley Coal & Iron Co., Ltd.	
Steels Engineering Products, Ltd.	
Stein, John G., & Co., Ltd.	
Sterling Textile Industries Ltd.	
Stewart & Gray, Ltd.	S5
Stewarts & Lloyds, Ltd.	
Stoves, Ltd.	137
Strachan & Henshaw, Ltd.	
Stringer Bros.	
Sugg, William, Ltd.	125
Sumo Pumps Ltd.	
Sutcliffe Speakman & Co., Ltd.	
Sutherland, A. G., Ltd.	
Sykes & Company	
T	
Taylor Woodrow Construction, Ltd.	
Telegraph Construction & Maintenance Co., Ltd.	
Thomas & Bishop, Ltd.	170
Thomas, Richard, & Baldwins, Ltd.	
Thompson, John, Conveyer Co., Ltd.	
Tully, Sons, & Co., Ltd.	S2
Turbine Furnace Co., Ltd.	S4
Turners Asbestos Cement Co., Ltd.	119
U	
Ufix Boiler Co., Ltd.	
Underpressure Engineering Co., Ltd.	
V	
Vale, Thomas, & Sons, Ltd.	
Visco Engineering Co., Ltd.	
Vulcan Stove Co., Ltd.	
W	
Wakelin, F. H., Ltd.	
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Waller, George, & Son, Ltd.	
Wellington Tube Works, Ltd.	
Westbury & Seend Ore & Oxide Co. Ltd.	140
West's Gas Improvement Co., Ltd.	Cover III
West's Piling & Construction Co., Ltd.	
Westwood & Wrights, Ltd.	
Whessoe, Ltd.	117
Whitehouse, Wm., & Co., Ltd,	
Whittaker Ellis, Ltd.	
Widnes Foundry & Engineering Co., Ltd.	130
Wild, M. B., & Co., Ltd.	
Wilkes, A. H., & Co., Ltd.	140
Willey & Co., Ltd.	
Williams, John E., Ltd.	Cover II
Williamson Cliff, Ltd.	S4
Wilson, George, Gas Meters, Ltd.	
Winn & Coales, Ltd.	
Winn, Charles, Ltd.	
Witkin Reynolds & Co., Ltd.	
Woodall-Duckham Vertical Retort & Oven Construction Co. (1920), Ltd.	Facing Page 160
Wright, Alexander, & Co., Ltd.	128

Agencies	
Appointments Vacant	S6
Books in Stock	S6
Company Notices	
Contracts Open	S6
Educational	
Miscellaneous	S6
Patents	S5
Plant, &c.	S6
Plant for Sale and Wanted	S6
Publications	
Repairs	S6
Trade Cards	170

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CONTENTS

EDITORIAL

	PAGE
A Good Start	147
The Junior Associations	147
On the Wings of Socialism	148
Behind the Film	148
Personal	148
Diary	149
School of Gas Turbine Technology	149
Rate of Flow Meters	149
A Fuel Efficiency Exhibition	149
News in Brief	150
North British Association of Gas Managers: Spring Meeting at Perth	151
"Gas Distribution Engineering," a Review by W. J. Hodkinson	154
The Gas Bill in Committee Stage (*Contd.*)	155
Association of Tar Distillers	156
Training Film Projectionists	156
Parliamentary Notes. By "Abaris"	157
Three May Meetings	157
Cornish Association	157
The Removal of Hydrogen Sulphide from Coal Gas by Means of Iron Oxide. By G. U. Hopton, B.A., B.Sc., A.M.I.Chem.E., The Gas Light and Coke Company	158
A Century of Service	169
Trade News	170
Gas Stocks and Shares	170

Advertisement Index Page 143 **Publishers' Notice Page S5**

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GAS JOURNAL

Vol. 254 April 21, 1948 No. 4429

A GOOD START

THE following statement was made by the Minister of Fuel and Power, Mr. Gaitskell, in the House of Commons on April 13 : "The House will recall that during the passage of the Coal Industry Nationalization Act and the Electricity Act certain members of the Central Boards were selected and appointed as Organizing Committees to make the necessary plans and preparations so as to avoid an unduly long interim period between the passing of the Bills and the vesting dates. The circumstances of gas are rather different, but I consider it desirable to secure the advice and assistance of the prospective Chairman and Deputy Chairman of the proposed Gas Council in making necessary preparatory arrangements, and Mr. A. E. Sylvester and Col. H. C. Smith have accepted my invitation to become Chairman and Deputy Chairman respectively when the Gas Bill becomes an Act of Parliament. With the approval of the Treasury I propose to fix a salary of £6,000 a year for the Chairman and £5,000 for the Deputy Chairman."

Both the Chairman and Deputy Chairman-designate are too well known in the industry for it to be necessary to recount the great service they have rendered, but we may record that Mr. Sylvester succeeded the late Sir David Milne-Watson as Governor of the Gas Light and Coke Company, but retired for health reasons (handing over the office to Sir David's son, Mr. Michael Milne-Watson) after holding the appointment for a year, while still retaining his seat on the Court of Directors. He was also Chairman of the British Gas Council for a similar period—from the time it took shape as a consequence of the merging of the National Gas Council and the B.C.G.A. until the state of his health prompted him to retire. When he went out of active office he was elected President, and Colonel Smith succeeded him as Chairman. Colonel Smith, President of the Institution of Gas Engineers in 1938, is Deputy Chairman and Managing Director of the Tottenham and District Gas Company and, as we have already indicated, has worked hard and most successfully as Chairman of the British Gas Council since Mr. Sylvester's retirement.

Because what they have done for the industry is so well known we have purposely dismissed it in the fewest possible words. What we would emphasize is that whatever else the industry may think about the prospects of nationalization, there will be only one feeling throughout the industry, or at any rate that 95% of it which is represented by the present British Gas Council—namely, that the right men have been chosen for the big tasks that will fall to their lot. Their qualifications for their jobs—Mr. Sylvester's more especially on what may be termed the commercial side, and Colonel Smith's more particularly on the technical and engineering side, though both are what we regard as "all round men"—are of the highest. The altered ownership and structure of the industry will inevitably bring changes in administration, but we know there will be the same earnest endeavour to serve the consumer as has characterized the industry's headquarters in past years. No one has been more outspoken in his opposition to the principle of nationalization than has Colonel Smith, but when nationalization is accomplished we cannot imagine him doing anything short of his best to ensure that the industry continues to maintain as cheap and as efficient a supply of gas as is possible to every class of consumer.

The Minister of Fuel and Power has still to make his selection of personnel for the Area Boards, and with a long list of eminently suitable people his choice will not be easy. If he is as happy in his selection of chairmen and members of the Area Boards as he has been in the case of the Gas Council chiefs he will have gone a long way towards ensuring success for what the British Gas Federation's Planning Report of 1943 described as a revolutionary experiment.

THE JUNIOR ASSOCIATIONS

DURING the past quarter of a century the Junior Gas Associations have greatly increased in membership and strength, and each year has seen an advance in the general technical standard of their proceedings. There is an infectious enthusiasm about their gatherings and we are glad that in 1947 we were able to launch our contemporary, "GAS"—a paper devoted solely to Junior activities and forming the basis of the Junior *Transactions*. We have been asked what the future will hold for the Associations under nationalization and how their functions will be-affected. We hope that the encouragement they receive will be greater than ever. Certainly the scope for young and able technicians will be vastly widened. Demand for gas both in home and in industry far outstrips supply, and prophecies regarding the "gradual" growth of the gas industry have been falsified in the event. The potentialities are there for all to see. Speaking last week to the Institution of Chemical Engineers, Sir Edward Appleton, Secretary of the Department of Scientific and Industrial Research, remarked that to-day's needs demanded men who had not only knowledge, but resource. He instanced a certain Dan Dawson, of Huddersfield, who had resource. He was the son of a dyer, and by tenacious experiment in the kitchen oven he not only dyed the family bread red (without killing the family), but was able at an early age to manufacture magenta. His resource led to well-earned monetary reward (which, by the way, would be unheard of in circumstances of to-day), and he was able to retire at the age of 37. He had resource and at this time he had resources ; but he was dissatisfied about his knowledge. So he went to Germany, where he studied under Hoffman. When he returned to England, and in particular to Huddersfield, he applied his chemical knowledge in a peculiar way. He built houses, streets of houses, and labelled them by the names of famous chemists. Dan Dawson had resource,

knowledge, also tenacity. These qualities, we are sure, characterize the ambitious Juniors of to-day.

As is well known, under nationalization England, Scotland, and Wales will, as far as gas supply is concerned, be divided into 12 areas. The broad delineation of these areas seems to us to be sound enough, and the fact that Sheffield, for example, a Yorkshire stronghold, happens to be in the area of the North Midlands under a new régime will alter neither its dialect nor its principles. Nor, we suggest, should the demarcation of the 12 areas interfere with the membership of the Junior Associations. It is most desirable that the Area Boards should not become technically watertight and that the junior of Sheffield (North Midlands) should still be a junior of Yorkshire, spilling the technical beans, if needs be, from the North Midlands to Yorkshire, unhampered in his comments by "nationalized" boundary red tape. We take Sheffield as an example only. Our argument and our contention apply to the Junior Associations throughout the land, East and West of England, East and West of Scotland, and Wales. We believe that if nationalization should artificially compartment these Associations, built with fervour and certainly without much financial backing, it would be a technical tragedy.

ON THE WINGS OF SOCIALISM

SPEED and discomfort are commonly associated. We should like to say a few words about lack of speed and discomfort, and rusted communication channels. How do individual coke oven managers fare under the National Coal Board? During the past few weeks we have visited several "independent" coke ovens and have talked with the managers of these carbonizing installations. After more than 15 months of nationalization these managers have no proper terms of appointment. They have no agreements. They do not know where they stand. Under private enterprise many of the managers' salaries were fixed with the background of free house, coal, and light. The houses are now the property of the N.C.B.; coke oven managers will have to pay rent and pay for their fuel, and they are not unnaturally asking that the basis of assessment should be defined. Several coke oven managers are perturbed about the present shrouding of insecurity and from experience of nationalization maintain that the ebb tide of initiative is flowing all two swiftly. In regard to communications, "passing the buck" is the order of the day, and underlying all this is the influence of the mine-workers. Ease and political fervour appear to go hand in hand. The N.C.B. flag has more than a touch of crimson, and businesslike methods are in truth going by the Board. Ideals on paper are not being translated underground. Sir Charles Reid, Production Director of the N.C.B., said on Saturday last: "It does not matter what we do; output per man has not risen and is not rising. There is something very wrong somewhere. We think there is a slackening of effort." We have been told by coke oven managers that this "slackening of effort" is seeping like a disease into the fibre of the coke oven industry and that multiplicity of N.C.B. officials is acting as a barrier to progress, as a deadening wad to enthusiasm and responsibility. We have no inclination to take the mineworker as whipping boy, but it is surely disturbing that coal disputes are piling on week after week. In spite of mechanization of the mines, coal output per man-shift is declining. In Yorkshire, 150 shotfirers have thrown out of employment about 8,000 other pit workers. One-third of the disputes take place in Scotland, which is responsible for only one-eighth of the total coal output. The National Coal Board is concerned with target figures. It hardly seems concerned about "coal" targets. A tonnage output is of little significance if "coal mined" means "coal plus dirt." The coke oven manager is troubled not merely about his individual claims, but about an indefinable atmosphere of irresponsibility which he discerns in the working of nationalization, which is characterized by lack of speed and much discomfort.

BEHIND THE FILM

One of the most remarkable fields of publicity development in recent years is that of documentary, educational, and trade films. In the van of this progress is the gas industry, which for over 10 years has contributed films of all types, exhibiting ever-increasing skill in their production. That this skill has reached a very high standard indeed is ably demonstrated by the Gas Light and Coke Company, whose latest film, "Behind the Flame," was shown to the industry at the Tivoli Theatre on Friday last, sharing the programme with "East Coast Collier." Introducing the film, Mr. Michael Milne-Watson explained that its aim is two-fold, to show the consumer what goes on within the Company, and to give the Company's employees an indication of how they fit into the picture. "It is," he said, "easy to forget when in a team how each person fits in with the other. We can only be successful if we realize the importance of how the other fellow works, and how we fit into the machine ourselves. We must appreciate our proper place in the family, for this is a kind of family organization in which we all try to fulfil our purpose." We feel that this viewpoint was impressed upon Mr. Gaitskell when he saw a preview of the film on March 16.

"Behind the Flame" is in no way a technical film, although much of its action takes place in gas-works and laboratories; its appeal is "popular," and no doubt its reception will be likewise. The film, which is produced by Gaumont British Instructional, Ltd., takes the audience through many of the activities of the Company—manufacture, distribution, research, sales, installation, accounting, and so on—and succeeds in compressing into half an hour a great deal of the Company's story. In making a film of this kind, there is no shortage of suitable material; the essence of the Director's skill lies in the cutting. Nor will a succession of varied shots ensure success unless the whole is lightened with occasional sparks of humour and humanity. In this respect, "Behind the Flame" is unusually successful, and care is taken to show the employees at play as well as at work. The Gas Light and Coke Company's consumers who see this film cannot fail to appreciate more fully the service they receive; the Company's staff will probably enjoy recognizing in the film themselves and their colleagues, and take pride in the size and efficiency of the organization to which they belong. Surely, we have here a worthy successor to "Gas Manufacture"; may its popularity be as long-lived!

Personal

At the annual meeting of the South Suburban Gas Company's Amateur Sports Guild at Sydenham, Lieut.-Colonel J. A. GOULD, M.C., Distributing Engineer to the Company, was presented with a clock in appreciation of his 16 years' service as a Directors' nominee on the Sports Guild Council.

* * *

Before leaving the Harrogate Gas Company to take up his new appointment as Engineering Assistant and Draughtsman to the Oxford and District Gas Company, Mr. JOHN B. LOWIS was presented with a travelling grip by Mr. F. W. Allum, Assistant General Manager of the York, Harrogate, and District Group of Gas Companies, on behalf of Mr. Lowis's friends and colleagues at Harrogate.

* * *

Reference is made in our editorial columns to the appointment of Mr. A. E. SYLVESTER as Chairman, and Colonel HAROLD C. SMITH as Deputy Chairman, of the Gas Council to be set up under the provisions of the Gas Bill, to take office from the vesting date. Mr. Sylvester, born in 1891, served in the 1914-18 war in the Sherwood Foresters, M.G. Corps. He is a Chartered Accountant and was partner in Barton, Mayhew & Company, Chartered Accountants, from 1920 to 1934, when he became Comptroller of the Gas Light and Coke Company. He was appointed General Manager in 1941 and Managing Director in 1942. He was Governor in 1945-46 and remains a Director. He was Chairman of the British Gas Council from 1945 until early in 1947 and has been Chairman of the South Eastern Gas Corporation since 1945. Colonel Smith, born in 1890, served in the Royal Artillery in the 1914-18 war and was awarded the C.B.E. in 1944. He started his career in the gas industry with the Birmingham Gas Department in 1906, joined the Tottenham and District Gas Company in 1920, was appointed Chief Engineer in 1922, General Manager in 1943, and has been Deputy Chairman and Managing Director since 1946. He was President of the Institution of Gas Engineers in 1937-38 and has been Chairman of the British Gas Council since Mr. Sylvester's retirement. He is also Chairman of the London and Counties Coke Association, the National Federation of Gas Coke Associations, the Solid Smokeless Fuels Federation, the Federation of Gas Employers, and Vice-Chairman of the National Joint Industrial Council for the Gas Industry.

Sir FREDERICK BAIN, M.C., a Deputy Chairman of Imperial Chemical Industries, Ltd., and Vice-President of the British Employers' Confederation, was elected for a second year as President at the annual meeting of the Federation of British Industries in London on April 14. During the war he was Chairman of the Chemical Control Board at the Ministry of Supply from 1941 to 1944, and Chairman of the Chemical Planning Committee, Ministry of Production, from 1942 to 1944.

Diary

April 22.—**Institute of Fuel**: Annual Corporate Meeting, Connaught Rooms, London, 11 a.m.

April 27.—**Midland Junior Gas Association**: Annual General Meeting. Film Evening.

April 27.—**Southern Association of Gas Engineers and Managers (Eastern District)**: "Sales and Service Organization for the Smaller Gas Undertaking," Lieut.-Colonel P. G. Wright. Gas Industry House, 2.30 p.m.

April 29.—**Yorkshire Junior Gas Association**: President's Day, Sheffield, 10 a.m.

April 29.—**Industrial Co-Partnership Association**: "Some Aspects of Co-Partnership," Right Hon. R. A. Butler, M.P., Royal Empire Society Assembly Rooms, Northumberland Avenue, 12.30 p.m.

April 30.—**Manchester District Association of Gas Engineers**: Annual Luncheon and Meeting, Grand Hotel, Manchester.

May 1.—**Western Junior Gas Association**: Annual General Meeting and Presidential Address. Swindon.

May 3.—**Eastern Junior Gas Association**: Annual General Meeting at Cambridge. Visit works of Cambridge University and Town Gas Light Company. 2 p.m.

May 5.—**Junior Institution of Engineers (Midland Section)**: "The Development of Domestic Gas Appliances," Colonel H. S. Walter. James Watt Institute, York House, Great Charles Street, Birmingham, 6.30 p.m.

May 7.—**London and Southern Junior Gas Association**: "Some Developments in the Application of Instruments and their Control in the Gas Industry," L. J. James (Electroflo Meters, Ltd.). Gas Industry House, 7 p.m.

May. 7.—**North of England Gas Managers' Association**: Annual Meeting, County Hotel, Newcastle, 2.15 p.m. Address by R. D. Keillor.

May 8.—**Scottish Junior Gas Association (Eastern District)**: Visit to works of the Corporation Gas Department, Dundee.

May 8.—**Manchester District Junior Association of Gas Engineers**: "Central Heating," H. Partington (Rochdale); visit to Lancashire Tar Distillers' Works, Bootle.

May 10.—**London and Counties Coke Association**: Technical Committee, Gas Industry House, 2.30 p.m.

May 12.—**Domestic Development Committee**: Technical Sub-Committee, Gas Industry House, 10.30 a.m.

May 12.—**Domestic Development Committee**: Gas Industry House, 2.30 p.m.

May 13 and 14.—**Wales and Monmouthshire Association of Gas Engineers and Managers**: Annual Meeting. Prestatyn.

May 14.—**Junior Institution of Engineers**: Fifth Stevens Memorial Lecture, "Coal, Oil, Chemicals," Dr. J. G. King. Royal Society of Arts, Adelphi, 6.30 p.m.

May 19 and 20.—**Eastern Association of Gas Engineers and Managers**: General Meeting, Norwich. (May 19: Golf competition, reception and dance. May 20: Business meeting; paper, "Refractory Materials in Relation to the Manufacture and Use of Gas," A. T. Green, O.B.E., F.R.I.C., 10 a.m. Association Luncheon, 12.15 for 12.30 p.m. Broads trip, 2.15 p.m.)

May 22.—**London and Southern Junior Gas Association**: Visit to the St. Albans Works of the Watford and St. Albans Gas Company.

May 25.—**Southern Association of Gas Engineers and Managers**: Spring General Meeting (preceded by informal luncheon), Connaught Rooms, London.

May 26.—**Manchester District Junior Association of Gas Engineers and Yorkshire Junior Gas Association**: Joint visit to Messrs. Newton Chambers, Ltd. Thorncliffe.

Bradford City Council is considering new street lighting arrangements. The Street Lighting Sub-Committee has recommended that the gas and electric street lamps, equipment, transport, and tools should be vested in the Corporation Finance Committee without financial adjustment, there being no debt. The Sub-Committee has also recommended negotiations with the Yorkshire Electricity and Gas Boards for the supply of electricity and gas for street lighting, and the maintenance of lamps and apparatus and the supply and erection of lamps and equipment as required. A further proposal is the establishment of the post of Public Lighting Superintendent to safeguard the interests of the Corporation.

SCHOOL OF GAS TURBINE TECHNOLOGY

Power Jets (Research and Development), Ltd., has taken over the School of Gas Turbine Technology at Ladywood Works, Lutterworth, hitherto run by the National Gas Turbine Establishment with conspicuous success.

The School is closed until May 31, for reorganization, the complete revision of syllabus, and the preparation of new lectures for courses in industrial gas turbines and kindred subjects. It is proposed to have academic courses for graduate engineers as before. There is room for some degree of specialization here—for example, in the various specific fields of compressor theory and design, combustion, &c., for which demand exists but is difficult to assess. It is also proposed to arrange practical courses for draughtsmen, testers, engineers, and operators, as may be indicated by the demand.

There is no profit motive represented in the operation of the School, the object of which is mainly to meet the wide public need for sound and accurate instruction in gas turbine technology.

RATE OF FLOW METERS

Readers will doubtless be interested to learn of the latest development in the new Mark II rate of flow recorders and indicators manufactured by the Metronic Instrument Co., Ltd. Model Mark IIS is now available for the measurement of fractional differentials, and may have ranges as low as 0-0*m* w.g. Its scale or chart is uniformly divided in direct-reading flow units; it is remarkably rapid and deadbeat in response to the slightest differential change; it is neutral to variations in density or temperature of its liquid filling; it is unhampered by any form of rubber tubing; it may be used with either pitot tube or orifice disc, and in the latter instance incurs a permanent pressure loss of only 0.1 in w.g. maximum.

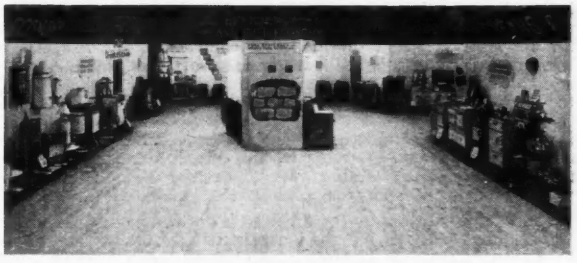
Mark IIS is identical in appearance with Mark IIL and uses the same primary U-tube casting. The mechanism is modified slightly to provide exceptionally low differential detection, and the range may be altered reliably and in a few seconds by simply changing counter weights. It may also be used for measurement of fractional pressures or draughts.

It may be mentioned that for laboratory or test work rates of flow from maximum down to about $\frac{1}{15}$th or $\frac{1}{30}$th may be determined without changing orifice discs or in any other way interfering with the set-up.

A FUEL EFFICIENCY EXHIBITION

A Fuel Efficiency Exhibition at Coventry was opened on April 3 by Sir Guy Nott-Bower, Deputy Secretary to the Ministry of Fuel and Power, and the Mayor of Coventry, Alderman W. H. Malcolm, J.P.

The Economy Campaign was inaugurated in Coventry last July by the then Mayor, G. Briggs, who, together with Mayors of other cities throughout the British Isles, was asked by the Ministry of Fuel and Power to form a local committee to work independently, to bring to the notice of the domestic and commercial consumers of fuel the grave possibility of similar fuel breakdown suffered during the winter of 1946-47.



A View of the Coventry Fuel Exhibition

Under the Chairmanship of Alderman Briggs, five committees representing the local municipal authority, and commercial, domestic, industrial, and education organizations were constituted. The Secretaries of the committees were appointed from the Sales Staff of the Coventry Gas Department. The campaign in Coventry was operated, however, somewhat differently from that of most other towns, in that propaganda about "Saving Fuel" was treated as secondary to "Correct Utilization of Fuel." The exhibition was organized almost entirely by the Sales Staff of the Coventry Gas Department.

News in Brief

The Grey (Discussion) Edition of Communication No. 33/18 (51st Report of the Joint Research Committee of the Gas Research Board and the University of Leeds) is now available from the Gas Research Board, price 2s. 6d. per copy (post free).

An Increase of 1½d. an Hour for gas workers was approved at a meeting of the National Joint Industrial Council for the Gas Industry last week on a claim for a 3d. an hour increase. About 100,000 workers are affected. In addition, there will be a 1s. increase for shift workers and proportionate increases for piece workers. They will apply retrospectively from April 4.

Mr. Leslie Hardern, Public Relations Officer to the Gas Light and Coke Company, had the honour of broadcasting in the same programme as Mrs. Franklin Roosevelt when she addressed the women of Britain in Woman's Hour on April 14. Mr. Hardern spoke about the advantages and disadvantages of the various fuels for heating and cooking in a new house.

A Development of the Shale Oil Processing Industry has been announced from Pumpherston, where Scottish Oils, Ltd., have created a new by-product, Iranopol—a detergent derived from the processing of shale oil. It is an amber liquid with a wide range of possibilities in the home and industrial field. It is intended to market the new detergent in retail packs for household use and in 40 gall. barrels for industrial use.

In Our Account of the annual general meeting of the Midland Association of Gas Engineers and Managers ("JOURNAL" of Mar. 24, p. 621) Mr. E. T. Pickering is reported as stating that of 200 candidates who took Intensive Courses arranged by the Institution of Gas Engineers 80 had been successful in passing the examination at their first attempt. The figure 80 is really a percentage—*i.e.*, 160 candidates were successful.

Burntisland Town Council has agreed to negotiate with the Kirkcaldy Corporation for bulk supplies of gas from Kirkcaldy to assist Burntisland in meeting its expanding obligations. The Scottish Home Department has had the matter under consultation for some time and has indicated that after consideration of all the factors involved it regards the delivery of a bulk supply from Kirkcaldy as the solution to Burntisland problems.

Members of the Institution of Gas Engineers and of the Gas Research Board are invited to attend a lecture on "Progress in Petroleum Research" to be given by Mr. C. S. Windebank, Research Manager, the Esso Development Company, Ltd., in the Chemistry Department of the University of Leeds on Monday, April 26, at 5 p.m. The lecture will include demonstrations and films illustrating the application of the fluidized principle to the catalytic cracking process.

At a Social Evening held by the Wolverhampton Gas Company Sports Club two men who recently retired from the service of the Company were presented with illuminated addresses and savings certificates. They were Mr. A. Attfield, with 47 years' service, and Mr. Joseph Weston, who had been with the Company for 46 years. Two other employees, Mr. Alfred Rogers and Mr. John Jordan, have received presentations, having served 21 years and 13 years respectively before their recent retirement, but both were unable to be present. Mr. W. Macnaughton (Chief Engineer) made the presentations on behalf of Mr. J. C. Neve (Chairman of Directors).

The B.B.C. Television Programme took a further step in novel presentation on April 6 by the introduction of a feature called "Inventors' Club." Inventors, amateur as well as professional, were invited to show the results of their work, which were discussed and assessed by a panel of experts presided over by Lord Sempill, who was for 10 years President of the Design and Industries Association. The panel included leaders of industry, manufacturers, and well-known scientific consultants. The Club, which is part of a campaign to find the latent inventive genius in this country and so extend the market for British goods abroad, as well as to encourage the home market, is the idea of Leslie Hardern, Public Relations Officer to the Gas Light and Coke Company. It came to him after he had taken part in television broadcasts dealing with industrial design; broadcasts which brought in many suggestions for household inventions.

The Interest Aroused by B.G.C. films is not confined to the British Isles alone. In recent months requests for Gas Industry films have been received from the United States, Canada, South America, India, New Zealand, and Tasmania. In Canada special interest has been shown in the education films "Transference of Heat," which deal with the elementary principles of convection, conduction, and radiation. These visual aids to education have proved wholly successful and are popular with both students and teachers. If imparting knowledge was the only function of their films, the B.G.C. would be doing an ample job, but in fact more is being accomplished. In distributing films abroad, they, with other documentary film sponsors, are making a contribution to the creation of a better understanding between industrial and other organizations throughout the world, and thus, by the spreading of knowledge, helping to build up international relations.

The Gas Light and Coke Company has given notice under Section 7 of the Gas Light and Coke Company (Charges) Order, 1921, as modified by the Gas Undertakings (Alteration of Declared Calorific Value) Order, 1943, that the calorific value of the gas which it intends to supply as from May 1 is 500 B.Th.U. per cu.ft.

The B.G.C. Film Tour of Scottish towns, now completed, was in every way a success. Three mobile cinema units with a selection of 16 mm. films made a tour of Scotland concentrating mainly on the smaller centres and aiming essentially at offering an educational service rather than propaganda. The units went as far north as Elgin and south to the Borders. In each centre shows were given to schools, women's clubs, and similar organizations. Particular attention was given to the showing of the films in centres where such facilities are not readily available, and for this reason the larger centres were avoided.

The Gas Light and Coke Company initiated its new Advice Bureau in the Acton Showrooms on Mar. 19. The Mayor of Acton (Alderman E. J. Lewis) opened this officially and pointed out among other things that all Acton's streets had gas lighting and that 90 miles of mains supplied Acton's gas. The Bureau will be run by Miss Mary Dolamore, the Company's Acton Home Service Adviser, and she will have the support and occasional help of her Home Service Organizer (Mrs. Macklin). The Bureau will answer questions on homecraft in its widest sense, including such subjects as design, colour schemes, decorations, &c. Special leaflets were designed for this centre, which promises well.

The Watford and St. Albans Gas Company's *Co-Partner* reports that one of the main attractions of the new houses on the London County Council's Oxhey Housing Estate recently opened by Lady Nathan, Chairman of the L.C.C., is the improved heating arrangements. A constant hot water supply is obtained from the space heating stove in the living room, and by means of ducts this fire also supplies background heating to two of the bedrooms. The linen cupboard is warmed by means of a hot water cylinder, while the first bedroom is fitted with a gas fire. All the houses have a gas copper installed. It is interesting to note that although the residents had a free choice of cooking by gas or electricity, the first 10 occupants chose gas.

Prior to the North of England Premiere of the sound film "Surface Dressing with Tar" in the cinema of the Sheffield and District Gas Company, a distinguished gathering of highway and county engineers, surveyors and others interested in the maintenance of roads, were entertained to lunch at the Grand Hotel as guests of the Directors of the Yorkshire Tar Distillers and the Staveley Coal and Iron Co., Ltd. Mr. H. E. Sugden, Chairman of the Yorkshire Tar Distillers, presided. The film is the result of the collaboration between the Department of Scientific and Industrial Research, the British Road Tar Association, and the Central Office of Information, and will be exhibited in various parts of the country. After the showing of the film, visitors were entertained to tea as the guests of the Sheffield and District Gas Company.

Development of Stainless-clad Steels—steels in which the stronger backing of boiler plate quality is faced with a veneer of stainless steel—has been announced by Colvilles, Ltd., of Glasgow, whose technicians have been engaged for many years on the technical problems involved. The mechanical bonding of the steels has demanded the creation of suitable equipment since the idea is essentially simple in conception and follows the principles of lamination familar in timber bonding. The effect of this development is that steels are now available which function successfully in circumstances which have demanded, to date, the use of stainless steel, but at a cost of perhaps only 75% of stainless types. Major use of the new steel will lie in those industries where protection against corrosion is vital. Among other industries, the laundering, textile finishing and dyeing, cleaning, chemical, food, milk, brewing and distilling, oil refining and similar processes promise a useful field of development.

Hertfordshire County Constabulary recently gave a demonstration and exhibition of their new radio equipment at the Hemel Hempstead showrooms of the Watford and St. Albans Gas Company. Two-way communication between the county police stations and radio patrol cars was demonstrated, with the object of interesting and seeking public co-operation to combat crime. The Gas Company's *Co-Partner* states that the new police radio system in Hertfordshire is the first of its kind in the world. For the operational side of the scheme Hertfordshire is divided into seven areas, each of which is patrolled by a wireless car throughout the 24 hours. When a call is received the nearest car can at once be directed to the spot, and if necessary several cars can seal off an area. The efficiency of this system was recently tested when a thief, who had entered the house of one of the Gas Company's Directors, was arrested within minutes after a description had been radioed to the area patrol car. While the scheme was in the experimental stage the wireless cars attended 640 incidents of a suspicious nature, and 172 road accidents. As a result of emergency calls 69 arrests were made, and 27 arrests resulted from direct observation by the crews of cars.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS

SPRING MEETING AT PERTH

THE Spring Meeting of the North British Association of Gas Managers was held on April 9, in the Lesser City Hall, Perth, the President, Mr. H. S. Milne, Aberdeen, presiding over a record attendance.

Extending a civic welcome to the company, Lord Provost **J. Ure Primrose** said that meetings of the North British Association had been held oftener in Perth than in any other city. In that respect they showed their good sense! The North to their meeting, thus demonstrating the keen interest taken by the Institution in the work of the district associations. On behalf of the Association he extended a cordial welcome to them both.

Dr. **H. Hartley,** conveying the good wishes of the Institution, said he regretted that he had been unable to accept the last invitation received to attend the meeting of the Association. Dr. **Braunholtz** also expressed his pleasure at revisiting Scotland.

Nominations for the election to vacancies in the Council at the

In the Sa'u'a'ion Hotel ballroom, Perth, on the occasion of the luncheon of the North British Association of Gas Managers, when the members were addressed by Mr. Arthur Woodburn, Secretary of State for Scotland. In the photograph Mr. Woodburn is seen on the right of Mr. H. S. Milne, President of the Association. Lord Provost J. Ure Primrose, of Perth, who accorded a civic welcome to the Association, is on his left.

Association came into being in 1862 and its first annual meeting was held in Perth. The city had given its fair share of Presidents to the Association. He had no wish to be contentious but could not refrain from mentioning the subject of nationalization, which would probably come up for discussion during their meeting. It might be all right for the unenlightened people in England, but in Scotland, where the vast majority of the undertakings were under municipal management there was not the same necessity for it. A great deal of the close contact existing between the consumer and the undertakings would be lost.

Returning thanks for the welcome, the **President** said the demands on the time and energy of a civic head were unending and they greatly appreciated his presence. The Association was no stranger to Perth although 14 years had elapsed since last they had met there. In the very early days of the Association Perth was the meeting place for three successive years, and altogether they had met nine times in that city. He asked the Lord Provost to convey to the Magistrates and Councillors their appreciation of the welcome.

The **President** intimated that since last they met the Association had suffered the following losses by death: Daniel Campbell, Kelty (Life Member); George Urquhart, Dunbar (Ordinary Member); R. M. Cairns, Glasgow, and David Gibb, Glasgow (Extraordinary Members); and W. B. McLuskey, Halifax (Honorary Member). Members were upstanding in memory of their deceased colleagues.

Mr. **Athol W. Brown,** Secretary, read apologies from members and from office-bearers in kindred associations.

The **President** said that Dr. Harold Hartley, President of the Institution, and Dr. W. T. K. Braunholtz, the Secretary, had come

annual meeting were called for and the following names were submitted: W. Nicol Baird, Perth; E. G. Smith, Dunfermline; George Keillor, Airdrie; A. McFadyen, Dumbarton; D. L. Dickson, Kirkcaldy; W. S. Johnstone, Dundee; W. Kirk, Motherwell; A. W. Farquhar, Forfar; and R. L. Laing, Brechin.

Mr. **Milne** then delivered his Presidential Address.

Mr. **D. D. Melvin** (Edinburgh), Senior Vice-President, proposing a vote of thanks to the President, said this was one of these special occasions in the annals of the Association when they had as President the son of a former President. The late Samuel Milne was President in 1912, and Harold Milne, also holding in a very capable manner the position of Engineer and Manager to the Aberdeen Corporation, now occupied the Presidential chair. This was another example of the family tradition one encountered in the industry, a tradition which extended throughout all grades of employee, and which they hoped would long continue. In Mr. Milne's Presidential Address they seemed to get a breath of that colder air which one naturally connected with Aberdeen where, no doubt as a symbol of confidence in the future of the industry, even the purifier house was built of granite. The President had described how he had tackled and overcome in recent years the difficulty of obtaining replacements for inadequate and out-of-date plant. The work, and particularly the replacement of purifier plant, had been so planned and dovetailed that the supply had not been interrupted, notwithstanding the exceptional rate of increase in output each year.

Mr. Milne seemed to indicate that he was approaching the limit of manufacturing capacity on his present site, although he had provided room in his development plan for plant having a higher capacity per unit of ground area. No doubt his work on the Gas Research Board had brought him into closer contact with

possibilities in this direction and had prompted him to make this provision. The problem of expansion of manufacturing plant was one that was concerning almost every works at the present time, and if integration took place on any scale, some of the manufacturing centres might find difficulty in expanding on present sites.

Development of New Methods

Development at an early date of new gas production methods, similar to the change from horizontal retorts to vertical retorts, with consequent increase in gas production per acre, would remove many a problem. If present high levels of costs for plant extensions continued they might serve as the necessary incentive for the production of some form of plant which would cope at least with peak loads, and which would not involve such substantial quantities of material and man hours in construction. Without ground for adequate gas storage accommodation at the works site, Aberdeen had been forced to find alternative accommodation elsewhere, and was providing additional storage in the most economical position—at, or near, the point of consumption. Substantial economies could be achieved by this method, enabling a better load factor to be obtained on the high and medium pressure systems, and assisting to cope with the peak hours of demand. The installation of flow recorders on the various district mains was to be commended, as peak hourly loads, exceptional in the north of the country, were now being experienced. These might be attributed to changed habits due to rationing, full employment, and other circumstances. In Edinburgh, for example, they found that the cooking load in the suburbs on Saturdays and Sundays was now quite different from what it was before the war, indicative of communal feeding throughout the week and the saving of the rations for the week-end. These changes in demand could only be anticipated by fore-knowledge of the demand characteristics. Mr. Milne's omission of any reference to nationalization was understandable, as the address was written before the Gas Bill was published, and in these days legislative changes took place so rapidly that any opinions expressed could quickly become out of date.

Now that the proposed structure of the industry was known, it would appear that Scotland when compared with other areas under the proposed set-up would be in a favourable position. As a financially independent unit, she would profit by the low capital value of the municipal undertakings; in fact, what was being accomplished was, in the main, the amalgamation of such undertakings into one. This would have many benefits in the pursuit of a common policy on the many questions of carbonizing methods and calorific values, coke and residual marketing, selling policy, wage regulation, and so forth, which had too many variables at present. A very great deal had been done in this connexion by voluntary methods, and he did not know of any other industry where so much time, thought, and knowledge were freely and voluntarily given for the benefit of the industry as a whole. If the Area Board could provide scope for the continuance of this team spirit and encourage local initiative and responsibility, he could foresee the Scottish area making still greater progress. They had enjoyed the President's Address, which recorded some useful work well done, and were looking forward to a visit to Aberdeen in the Autumn when they might have the opportunity of seeing what had been described.

Aberdeen's Record

Seconding the vote of thanks, Mr. **R. Sturrock** (Ardrossan), Junior Vice-President, said Mr. Melvin had made reference to the unusual and rare experience they had had that morning in having a Presidential Address submitted by the son of a former President. It was interesting to record that the connexion between Mr. Milne's family and the North British Association now extended over half a century. The city of Aberdeen had been singularly fortunate in having the Managerial chair of its gas undertaking occupied during the past 44 years by an illustrious father and son in the persons of the late Samuel Milne and the present President. Mr. Harold Milne, in his address, had with characteristic modesty, covered the development of the Aberdeen gas undertaking over the past 36 years and they could appreciate the enormous amount of time, thought and energy expended by the management during that period, to bring about the resultant high state of efficiency existing in the works of the Aberdeen Gas Department to-day. Mr. Milne had issued a timely warning concerning the adoption of safety measures in their works and in their distribution operations. During the war years many of them had the unenviable experience of having enforced changes in the personnel of their staffs. A tightening up and enforcement of these measures was now therefore desirable.

When they met in Paisley a year ago, it would be recalled, Lord Balfour, Chairman of the Scottish Committee of the National Coal Board, indicated that it was unlikely that the gas industry would receive the quality of coal it required for at least another year. Reference had been made by the President in his address to the improvement in the quantities of coal delivered during the past year and he had expressed the hope that cleaner coals would be forthcoming in the future. Many of the difficulties connected with their plants would be considerably eased were lower ash coals provided for their operations, together with a freezing and stabilization of prices. With regard to the reference made by Mr. Milne to the Scholarship offered by the Association to enable students who were suitable to obtain a higher education in science and engineering, it was regretted that, so far, no candidate with the necessary qualifications had presented himself for this grant. The Council were hopeful that the application would not be long delayed and that the recipient would derive much benefit from the assistance afforded. The Institution of Gas Engineers was to be commended for its action in introducing the new Associate Examination. This would inevitably call for a higher standard of education from recruits entering the industry and provide students possessing the necessary qualifications to go forward as suitable candidates for the course.

Luncheon Speeches

The Association Luncheon was held in the Salutation Hotel, Perth, the President being in the chair.

Following the loyal toast, Mr. **Arthur Woodburn,** P.C., M.P., Secretary of State for Scotland, proposing the toast of "The Gas Industry," said the economic life of the country was based on two fundamental things—food and power. Electricity had been so advertised and had become such a public attraction that people were apt to forget the importance of the gas industry. Industry generally was looking to gas to make its contribution to the economic well being of the nation. At the moment they had reached a turning point in the industry and he wished to pay tribute to its pioneers. It was a Scotsman, William Murdoch, who first lit the vital flame and it had never gone out since 1792. To-day it was burning better and brighter than ever. The pioneers who built up the industry were what were now known as "back-room boys," working in laboratories to find more efficient methods of producing gas. In this connexion much good work had been done in small towns with small producing units. From such places some very good engineers had come to do excellent work for the Association.

The Heyworth Report, said Mr. Woodburn, had suggested reorganization of the industry. It left no alternative but to bring about a national co-ordination. Nationalization was bound to cause some heart-burning among those who felt that the present organization was quite efficient. The Advisory Committee felt that small works could be improved if they were visited by men with expert knowledge. It would then be possible for the more isolated units to receive technical and other help from the centre and so make better use of the facilities they had. Many organizations in the land were changing over. Within the last year they had seen the end of the old Poor Law system; a new National Health Service was coming and he was glad to see signs that the doctors were likely to come harmoniously into the new scheme. Electricity had been nationalized and now gas would follow. Nationalization did not follow any uniform process in this country.

More Decentralization

The previous Government had nationalized the B.B.C. as a Board and the Post Office, the Army, the Navy and other services were nationalized. As far as Scotland was concerned a new development was taking place with regard to the nationalization of gas. There would be more decentralization. Scotland would have its Area Board and the Scottish Gas Board would be practically autonomous. A Central Council would co-ordinate all research work throughout the country. The Chairman of the Scottish Gas Board would be a member of the Scottish Economic Conference which would focus and co-ordinate all who controlled the economic affairs of Scotland and he looked forward to getting advice and help from that Conference so that they might develop Scotland. There would be a Scottish Consultative Council and its chairman would be a member of the Scottish Gas Board. It would form a link between the consumer and the Board. The advantage of nationalization and co-ordination on this basis would be that all in the industry would be brought together in one team. It was true that through their Association they came together once or twice a year, but they were not one team. Some of them were isolated, but by next year they would all be members of one great organization existing for one purpose, namely, to produce gas in the best and most economical way so that the public could look back and consider this step to have been for their benefit and the benefit of the nation as a whole. He was anxious that industry should make more use of science. When he was in the Ministry of Supply he had been depressed to find the small use made of science by industry in Scotland. Scientists had to leave Scotland and it was not good for the country. Science was the vital background of any successful industry.

The Minister of Fuel and Power, said Mr. Woodburn, when he came to meet them personally, would recognize that Scotland had the technical ability which would allow her to play her part in the development of the gas industry. On his own behalf and on behalf of the Minister of Fuel and Power he thanked them

for the co-operation they had shown. What was being done was for the good of the country and from every section of industry men of great ability had placed themselves freely at the disposal of the country. Gas engineers had their job at heart and the devotion to duty they had shown in the past would be continued in the future. He had therefore no fears for the days ahead. Atomic energy might become the means of generating power and some people thought that this would do away with the need for gas. But they had a wealth of available and inexhaustible material in their residuals. The gas industry would lead in the further exploitation of the advantages of coal. It would yet show the world that the small flame had developed to an incandescent light which would irradiate the earth.

Replying to the toast, Dr. **Harold Hartley,** President of the Institution, said for those engaged in an industry it was not always easy to appreciate how that industry might stand in the eyes of their fellow countrymen. It was nearly a century and a half since coal gas was first supplied for public use, and they might all feel proud that to-day this mature industry was more vigorous than ever, and had confidence in its future prospects. At the time of its birth it was stimulated by the antagonism of the ignorant. Later, when its position had become well established, it had to face the danger of stagnation, at the time when it seemed that those who were controlling it would be operating a monopoly. Before the rot could set in, the electrical industry was born, and the competition of this younger but energetic rival had provided a great stimulus to increased effort. At the beginning of the present century there were some who thought the days of the gas industry were numbered, but instead they found this public utility had gone from strength to strength, and was now of a magnitude hardly conceived by those of an earlier age. The town gas industry, originally developed to provide means of lighting homes and cities, had now become a great heat supply industry. In the 20 odd years which had followed the introduction of the therm basis of charge for gas supply, there had been a 70% increase in gas sales—this by an industry which had already been in existence for over a century.

The outlook of most in the industry was determined by their conception of the need for service to the consumer. The staffs of the constituent supply members had for long been imbued with a co-operative spirit and a great feeling of loyalty, not merely to the particular organization by which they were employed, but to the industry as a whole. The re-organization envisaged in the Gas Bill now before Parliament would make it possible for those in whom the responsibility for control would be vested to make progress such as would be impossible were integration not effected. Whatever their political outlook, the majority of technicians were agreed that integration could do much to enable adequate development to be effected. As no new loyalties had to be created, there should soon result some of the advantages of an even closer co-operation than had been possible in the past.

Maintenance of Incentive

When nationalization of the fuel industries was first mooted, there was a fear that competition between the industries, and more especially within the industries themselves, might be eliminated. The human race had not yet developed to the stage when the individual would give of his best without the spur of competition in some form or other, even though the urge be only that provided by a desire to stand well in the eyes of one's fellow men. They had, he thought, every reason to feel that under the nationalization scheme propounded in the Gas Bill, there should be as great an incentive as in the past for the energetic to expend effort in making progress. This would especially be the case if the Minister of Fuel and Power decided that the form of annual report to be submitted by the Area Boards should be such as would allow of direct comparison of their operational efficacy.

The town gas industry was technically sound. It operated at a high efficiency, be it in making or in the use of gas. It realized the importance of research, and was probably as research minded as any other industry in the country. It was generally agreed that the planning and conducting of technical research was the function of scientifically trained men, chemists, physicists, and the like who had had experience in the application of research in industry. In the past the gas industry had looked for guidance in technical and educational matters to the Institution of Gas Engineers and the Gas Research Board, and he hoped, after nationalization was effected, full advantage would be taken of the machinery in existence, which encouraged co-operative effort. Research activity, however, should not be limited merely to the development of processes for the making and purifying of gas, or of means for its distribution and utilization, or to the manufacture and use of coke, but must be concerned also with matters such as consumer reactions, the effect of load variation on the development of the industry, and so on.

Although in the past much of the technical research had been done on behalf of the industry on a co-operative basis, market investigation had been left to a few of the largest undertakings, and to some manufacturers of appliances, and had in general been inadequate. When integration became effective, no doubt such functions would be extended, and as a result they would obtain a better appreciation of consumer needs and of the great possibilities for an extended use of gas. The Chartered Institution which he had the honour to represent, and to which the Association was affiliated, was founded some 85 years ago and, like the North British Association, it aimed at fostering a corporate spirit among its members. One of the special functions of the Institution, however, was to provide a hall mark of competence for the Chartered Gas Engineer who might have been trained as a chemist, physicist, or engineer. He would suggest that in view of the qualifications for its membership, it should be recognized, within a reasonable period in the future, as a sine-qua-non that anyone appointed to the higher technical positions in the industry should be a corporate member of the Institution of Gas Engineers. It was his belief that the continued success and efficient operation of the industry was closely wrapped up with the continued success and efficient operation of the Institution.

One of the functions of technical institutions was to provide means for the publication and discussion of memoranda dealing with professional, technical, and educational matters, and it was essential that the technicians should always be able to express their views and relate their experiences with that degree of freedom they had enjoyed in the past. It was especially important, therefore, not only that their scientific and technical institutions should retain their freedom, but that they should grow in strength. In this last year of private enterprise, it seemed advisable to arrange for a series of papers which would show the state of the art of gas manufacture and supply as at June, 1948, and give some indication of the possibilities for the future and no doubt be something of a challenge for the nationalized industry.

For many years it had been the practice of the Association to do honour to the President of the Institution of Gas Engineers by allowing him to reply to the toast of the gas industry. He did not know whether any of his predecessors had the privilege of thanking His Majesty's Secretary of State for Scotland. If so, he was sure they could not have had the honour of replying to a more cheering and helpful proposal of the toast than that of Mr. Woodburn.

Proposing the toast of "The City and Royal Burgh of Perth," Mr. **Duncan Fraser,** Lord Provost of Aberdeen, said that Perth was a burgh in 1106 and a Royal Burgh in 1210, and was the Capital of Scotland till 1482. One of its liquid productions had helped them considerably in the dollar areas. The Lord Provost of Perth took precedence over the Lord Provost of Aberdeen.

Lord Provost **J. Ure Primrose** replied in a humorous speech. He was glad that Mr. Woodburn had not heard his remarks regarding nationalization, made at the forenoon session, but he would still say that in Perth they took great pride in their gas undertaking.

The North British Association

Councillor **H. C. Brechin,** Convener of the Gas Committee, Aberdeen, proposed the toast of the North British Association. It was, he said, older even than the Institution and had rendered great service to the industry, both in Scotland and further afield. The Association was greatly interested in the training and education of young engineers and the generosity of the members eased the lot of some of their aged colleagues. Many changes had taken place since the Association was formed. Many undertakings had been taken over by local authorities and there had been a time when it was thought that electricity would mean the end of gas. But gas and electricity had progressed together and gas had gained in strength and popularity. Another change was coming and he did not know the details of nationalization, but it was to be hoped that for administrative purposes Scotland would be divided into moderately sized areas so that decisions could be made on the spot and consumers could have personal attention. The mode of life differed in Scotland in different areas and such an arrangement was necessary. He was confident that the members of the Association would give the same service in the future as they had given in the past. He was gratified to see Mr. Milne, their Engineer and Manager, at Aberdeen, in the chair of the Association. It was the third time they had come to Aberdeen for their President, the three gas engineers they had had in Aberdeen over the last 82 years, all having occupied the chair.

Responding to the toast, the **President** said the Association originated in 1862 with the formidable title of "The Association of Gas Managers for the Counties of Fife, Kinross, Perth, and Forfar." Later in the same year there was formed in Edinburgh a smaller Association called "The Scottish Association." In 1866 the two bodies joined to form one Association with a membership of 54. Six years later the managers in the West formed a West of Scotland Association which merged with the North British Association in 1883, making it truly representative of the whole of Scotland. It was fitting that at that time the Association should return to Perth, the city of its origin. He felt that the Association should meet from time to time in various parts of the country and their annual general meeting would take place in Aberdeen.

Referring to the future, Mr. Milne said they would still continue to serve. Most of them had been brought up in a hard school and they would overcome any difficulties which arose. Consumers must have no cause for complaint. The months which

lay ahead would be difficult and it was to be hoped that those with the best interests of the industry at heart would not be embarrassed by any feeling that it was being treated as a stepbairn.

Mr. **Lewis Bain** (Cullen), who was in the chair when last the Association met at Perth, proposed the health of the President, and Mr. James Dickson, formerly of Dundee, expressed the thanks of the members to the Secretary and to all who had contributed to the success of the gathering.

The Golf Circle

The Spring Competition was held over the King's Course, Gleneagles, on April 8. The results were as follows: Winner of Winson Scott Cup—C. A. Chapman (Glasgow, 85—9 = 76; 2nd, Jas. Brook (Glasgow), 80—1 = 79; 3rd, D. Fulton (Hellensburgh), 96—15 = 81; 4th, J. M. Dow (Paisley), 92—10 = 82; 5th, R. L. Laing (Brechin), 92—9 = 83; 6th, D. J. Colvin (Edinburgh), 98—14 = 84.

The winners in the competition for visitors were: H. Johnson (Glasgow), 84—4 = 80; G. E. Currier (Bradford), 103—22 = 81; Chas. Mitchell (Ayr), 95—10 = 85.

A business meeting of the Circle was held in the Clubhouse after play, when the Captain, Mr. Sam Hall, stated that the meeting had been the best attended for many years. Mr. Hall was presented with the Captain's Badge and the usual votes of thanks were proposed, with emphasis on the hard work put in by Mr. W. P. Rae, the Secretary, and Mr. Lewis Fletcher, Jun.

S.B.G.I. SILVER MEDALS

The Council of the Society of British Gas Industries have again this year awarded silver medals to the Junior Gas Associations for the best paper adjudged to have presented during the year by their members at a general meeting. Twenty-two papers were submitted by seven Junior Gas Associations for adjudication and awards were made as follows:

London and Southern.—C. D. Shann (Gas Light and Coke Company) for paper on "Some Investigations on Leakage from Gas Distribution Systems."

Manchester.—A. J. Brandram (United Kingdom Gas Corporation) for paper on "Corrosion on Gas-works."

Midland.—R. Thompson (Bilston) for paper on "The Engineer and the Accountant in the Gas Industry."

Scottish (Eastern District).—I. M. Anderson (Edinburgh) for paper on "Mechanical Aids in Mainlaying."

Western.—T. W. Clapham (Bristol) for paper on "Low Pressure Boosters and High Pressure Compressors for Raising Gas Pressures."

Wales and Monmouth.—H. Buckley (Pontypool) for paper on "Random Thoughts on Steam."

Yorkshire.—E. S. Carter (Halifax) for paper on "Canteens in Industry."

"GAS DISTRIBUTION ENGINEERING"*

A Review by W. J. Hodkinson

FOLLOWING his valuable publication the "Manual of Gas Fitting," and the joint authorship with Norman Smith of "Domestic Utilization of Gas," Mr. R. N. Le Fevre has now written an excellent text-book designed to serve as an introduction to the subject of gas distribution practice covering the general principles involved in conveying town gas from the gas-works to the point of entering the consumers' premises. In his preface the author says that his main objective has been to present the essential facts in a simple manner and in the first volume to cover the examination requirements of the Institution of Gas Engineers up to Ordinary Grade standards.

Mr. Le Fevre has undoubtedly achieved the main objects of his task. The book presents in simple but comprehensive form a complete introduction to the study of gas distributing practice, and while in the main it may be considered as a student's text book, it will undoubtedly find its place in most distributing engineers' libraries.

The range of the book is most comprehensive. The first chapter opens with an introduction to the general principles, meaning, and scope of gas distributing practice and introduces the student at the outset to the importance of the consideration of load factors and demand diversity as affecting the design of a distributing system. Types of systems and their development are explained by reference to simple diagrams which facilitate a ready appreciation of the basic principles involved.

The next three chapters deal with pressure covering the ranges used for distribution work, the measurement and sources of pressure, and describe the application of the various types of pressure raising machines available. The flow of gas in pipes and flow formulæ are dealt with very thoroughly, and in the fourth chapter Mr. Le Fevre covers the methods of controlling pressures and describes in simple but adequate measure the many types of equipment available for this work. At this stage, having in Chapter I introduced the student in a preliminary manner to the functions of a gas grid, the author might well have mentioned the controlled volumetric governor which now finds general application in the control of such systems.

Chapters V and VI deal with the materials used in distribution practice and the tools and equipment required for distribution work. At this stage the author takes the opportunity to introduce the student to the more simple power-driven tools used for mainlaying work.

In Chapter VII, under the heading of "Mainlaying," the author deals with the important considerations affecting the preliminary work prior to proceeding with actual mainlaying work. He rightly lays emphasis on the need for careful planning, bearing in mind that once the work is completed it is generally out of sight and not readily accessible for maintenance or repair, and, what is more important, once laid the main cannot easily be altered.

For the assistance of the student, Mr. Le Fevre "pin-points" the many factors to be considered in predetermining selection of route, choice of materials, co-ordination of work with other statutory bodies, costs of mainlaying, &c.—important points which are all too often neglected in the early training of a distributing engineer.

The practical aspects of mainlaying work are well covered in Chapter VIII and the author takes the wise precaution of emphasizing the importance of practical experience as the only satisfactory training in this work. Nevertheless, this section and the following one entitled "Service Laying" will yield adequate return to the student by careful study. The paragraphs on testing of mains for soundness are carefully compiled, although the Table of Air Pressure Tests might lead the reader to the conclusion that cast iron mains are limited to a test pressure of 20 lb. per sq.in., whereas we know that there are several examples of spun iron mains in this country laid to an air test pressure of 60 lb. per sq.in. for operating gas pressures of 35 lb. per sq.in. Two small paragraphs deal with the necessity for maintaining records of mains as laid. This essential work might well have been amplified and its importance brought home to the student who in the smaller undertakings may be responsible for the maintenance of such records.

The next Chapter is devoted to working on mains and services under gas pressure and describes the many precautions to be taken under such conditions. It lays stress on the need for adequate precautions when dealing with gas escapes and recalls the lessons of our wartime experiences in dealing with damaged mains.

Finally, the book deals with the maintenance of mains and services, factors influencing the fracture of mains, and the methods of repair, types of stoppages in mains and services, and their removal. This Chapter also contains an excellent section on the subject of unaccounted-for gas, wherein the author itemizes the factors which may contribute to unaccounted-for gas and also the methods of reducing leakage, both extracted from that excellent paper "Some Investigations on Leakage from Distribution Systems," by C. D. Shann, published in "GAS," March and April, 1947.

The book is liberally illustrated with photographs of plant and equipment and, more particularly, line and detailed sketches which should prove invaluable to the student studying for the examinations of the Institution of Gas Engineers (Supply) Course. It will undoubtedly prove a great boon to both lecturer and student and fill a gap which exists in the present limited range of text-books available in the gas industry.

* "Gas Distribution Engineering," by R. N. Le Fevre M.Inst. Gas E. A.M.I.Mech.E., Walter King, Ltd., 22s. 6d. post free.

Gloucester Gas Light Company recently held a course of lessons in practical cookery for business girls and young housewives. This was so successful that there have been many requests for a further course. This has now been arranged and will consist of six practical lessons in which the pupils prepare the meals and cook them in the cookers fitted up in the demonstration theatre. At the moment there is a waiting list of ladies wishing to take this course.

THE GAS BILL IN COMMITTEE STAGE

(*Continued from page 97*)

ON Tuesday, April 13, Mr. Peter Roberts moved the deletion of paragraph (c) in sub-section 1 of Clause 15. His point was that an arbitrary line had been taken in deciding which of the gas corporations should be taken over and which should not. Six to seven out of 12 were taken, one single corporation holding a single gas company was taken, and two ancillary, one statutory, and two or three others were left out. Why did the Minister want to include in the Bill the non-gas assets of these corporations, and why did he want to include in the Bill one company which had no gas interest at all? His second question was what did the Government hope to get out of the gas corporations they took over?

Colonel Clarke, in support, said it was hard that bodies which, some years ago, themselves undertook to commence the work of integration should now be treated in a way which was ungrateful and inequitable.

Mr. I. J. Pitman called attention to paragraph 246 of the Heyworth Report, which says: "Only the assets attaching to gas production and distribution should be taken over from joint gas and electricity, and joint gas and water, undertakings."

Value of Holding Companies

The Minister of Fuel and Power said they wished to take over certain holding companies because they were an integral part of the industry. They had done valuable work in integrating different undertakings in the past. They had very useful managerial, technical, and financial organizations, and also purchasing organizations. All this would be most valuable to the Gas Area Boards, and they were anxious to see that the Area Boards were not handicapped at the outset. It would be a great mistake for them to be deprived of the assistance they would undoubtedly receive from taking over the holding company organizations. When they came to the question of what companies should, and what should not, be included, the line must be drawn. The position in regard to the corporations was that eight of them vested as gas holding companies, one vested as a statutory undertaking, two vested as ancillary, and one was omitted altogether. One of the holding companies had sold out of gas, and it would obviously be inappropriate to take it over. It was not their desire to take over electricity undertakings; in any case the statutory electricity undertakings would already have passed to the Electricity Area Boards; there would not be any more electricity undertakings to take over. If there were still undertakings which included water as well as gas, then he would see what they could do about it. The major holding companies primarily engaged in gas must be taken over. They would consider where the exact line was to be drawn.

Mr. Bracken: May I appeal to the Minister to give us a list of the companies before the Report stage?

Mr. Gaitskell: I can see no objection to publishing a list on the understanding that it simply indicates which companies under the Bill as it is drafted are covered by the Bill. I suppose that we could arrange for that to be published in the technical Press.

The amendment, by leave, was withdrawn.

On Wednesday, April 14, Clause 16—determination of questions as to the application of Part II—was first debated, Mr. Bracken moving the substitution of "two months after the passing of this Act" for "the prescribed period." He argued that if this was accepted it would eliminate the possibility of hardships on a number of small people.

Mr. Robens replied that they could not accept the amendment, for the specific reason that the period of two months would not be sufficient time in which to deal with the problem. However, the Ministry was gradually accumulating a good deal of material which would shorten the time required to send out notices.

The amendment was negatived.

Vesting of Assets

Clause 17 (vesting of assets) was then considered. Colonel Crosthwaite-Eyre moved the insertion of the following words: "The vesting date shall be not less than six months after the establishment of all the Area Boards and not less than three months after the establishment of the Gas Council and the definition by Order under Part I of this Act of all the areas for which Area Boards are established shall not be earlier than April 1, 1949.

Mr. Gaitskell said they agreed that some reasonable time should elapse between the appointing of the Gas Council and the Area Boards and the vesting date. They would, however, like to see the Chairmen of the Area Boards coming first, because they were going to be members of the Gas Council, and it was very desirable that the Gas Council should be in existence before all the members of the Area Boards were appointed. One had to remember that a number of them were part-timers. He would look into the matter and, if necessary, put down an appropriate amendment.

Amendment, by leave, withdrawn.

Colonel Crosthwaite-Eyre said that as the Clause was drafted, in the case of a statutory undertaker the assets must be transferred to a particular Board. The Minister had no right to divide up the assets of an undertaker between two Boards until after the vesting date. If one were to take a company like the British Gas Light Company, which was a statutory undertaking, it was probable that its assets would have to be split up between a number of Boards. The Minister would have to transfer the assets of that company to one Board and subsequently re-transfer them from that one Board to other Boards. That seemed to him to be a clumsy business.

Mr. Gaitskell: There is no reason why the property of an undertaking should not, to start with, vest wholly in one Area Board and then be divided between other Area Boards. I give an undertaking to reconsider this matter. It is purely a question of which would be the most convenient manner in which to handle the cases where the area boundaries do not precisely coincide with the boundaries of the present undertakings. There are two ways of doing that. One is to vest in the Gas Council the undertakings which fall into the difficult category, and then divide them out, and the other is to vest them in one Area Board and then divide them out. I have said that I will reconsider the matter."

Amendment, by leave, withdrawn.

Compensation of Directors

Paragraph (c) of sub-section (5) of Clause 17, reads: "No right, liability, or obligation, under any agreement for the rendering by any person of services to any such undertaker as a director (other than a managing director or a director whose functions are substantially those of an employee) shall be transferred to any such Board or to the Gas Council, except any liability in respect of fees earned or expenses incurred before the vesting date."

Mr. Raikes moved to insert, after "employee," the words "or a director who was formerly employed whole-time by one or more undertakers to whom this Part of this Act applies." The amendment, he said, aimed at taking care of technical men appointed as directors after their retirement. The Gas Council and the Area Boards, according to the Bill, were relieved of all obligations in regard to directors except in the case of managing directors, and also of directors whose functions were really those of employees. However, there were certain other cases which ought to be met. Mr. Raikes continued: "For example, there might be the case of a retired gas engineer who, after his retirement, is taken on to the board as a director. He is really a technician, he has been an employee all his time, but he is taken on after retirement from being a full-time employee, and it may be in certain cases that he has also had a reduction in pension in view of being taken on in that capacity.

"There is another case which would probably be governed by the words of this amendment, and which exists in a number of instances. An engineer or some other official of a gas company may be given a contract to act as a director of a smaller company under the larger group. He is not paid a director's fee by the smaller company, but his contract gives him remuneration from the larger company. Again, he really is an employee to all intents and purposes but, so far as I can see, under paragraph (*c*) he again would be prevented from receiving any compensation under the Bill as it stands."

Mr. Robens: "Let us take the case of the employee, the engineer, who is made a director of a small subsidiary company, receives no fees from that small subsidiary, but it is regarded as part of his job and he is paid his salary by the main undertaking. It seems to me that he is treated precisely as an employee and that, as he was not receiving a fee from the subsidiary company, his loss of directorship cannot lose him his fee because he did not have one."

Mr. Bracken: "Surely this must sometimes happen: Supposing a man who has spent a great deal of his life in the gas industry does a certain amount of work in his old age, acting as a director perhaps of two or three small subsidiary companies, but getting a director's fee from the main company. He is not a full-time employee of the main company, but in effect he may be the manager of the subsidiaries."

Mr. Robens then took the case of the director of a subsidiary or a number of companies who was retired, and then came back and took up a position at a salary which meant a reduction in his pension. An employee, not a director, retires on a pension

and comes back as a director because of special qualifications, but at a reduced pension because of that. "It seems to me," said Mr. Robens, "that an employee who retires on a pension, is brought back subsequently, has his pension reduced because he becomes a director, and his directorship then ceases by reason of this Measure, has a reasonable case to ask, and, I should think, to receive his contractual pension that he had prior to the time he was a director. That seems to me reasonable and fair."

Mr. Pitman: "In many cases there is not a contractual pension. There are cases in which it is an agreed pension and, at the back of the minds of the directors in determining that has been the consideration that they are proposing to make Mr. Snooks a director of their own company or of the subsidiary and, in view of that, it would not be right to agree such a large pension as would otherwise be the case."

Mr. Robens: "If a pension has been paid, even though there is no written contract, it is quite clear that it has been paid by agreement in respect of past services. Therefore, I do not think it is necessary to say that it should be a legally drawn up contractural obligation in respect of a pension, nor does it mean necessarily that it must be a contributory pension scheme or a non-contributory pension scheme. The fact that a pension was paid, and proved by the fact that it was paid, it seems to me, would be reasonable evidence to say that fairness and justice should be done to the individual along the lines I have indicated" Mr. Robens added that "the genuine director was covered by paragraph (c) of the sub-section. It would be wrong to accept the amendment, which would let in a host of people whom they had no intention of compensating in this way."

Mr. Foster: "A director employed full time as a director cannot be an employee, so the Measure has to say: 'whose functions are substantially those of an employee.' The two things are different, and it is like saying of a soldier, 'whose functions are substantially those of a sailor.' I am trying to meet the argument that these words will cover a director who is a director of 30 companies, and I submit that they cannot do so, because he could never be said to be employed by 30 companies. That is impossible, as in law a director cannot be employed by a company, and it is as different as the difference between a soldier and a sailor."

Mr. Foster: "We have the case of an engineer employed by the main undertaking. Part of his salary is paid in director's fees as director of a subsidiary, because it gives him a little more importance and the work is more interesting for him. Only workpeople are covered by this amendment—people who have been employed by gas undertakings in a whole-time capacity and who are then put on the board of a gas company. There a director's fee either takes the place of pension or it may take part of the place of their contractual reward on the main undertaking. There is no sinister purpose about guinea pig directors who cannot be covered."

Mr. Gaitskell: "In the Bill as drafted we say, in effect, that a contract between a person who, though a director, has functions which are substantially those of an employee, is a contract that must be respected and carried on. If it is not carried on, then, of course, he has a right to compensation subject to what the courts may decide on the matter. It is equally clear that a director who has not functions which are those of an employee, will not be entitled to have any contract that he may have with the company honoured in future.

"We do not specify here whether or not such directors are to be whole time. Under our drafting, it would be possible for a director, who was only part time but whose functions were substantially those of an employee, to have his contract honoured or to obtain compensation. . . We have in mind that there may be a man who happens to be a director, and who is called a director, but who is really doing the same sort of job as an employed man. For that reason, he ought to be put in the same position as the man employed. . . A man may have been an engineer employed by a company. He becomes a director—very much a part-time director. He draws his full pension from the company and he also draws fees in exactly the same way as any other part-time director. Why should we benefit him particularly? I cannot see any particular reason why he should be singled out. There may be other part-time directors. I make no accusations against them; we simply feel that they have not a case for compensation. That does not mean that in the past they have not given valuable advice to the company. So also may a previous employee have given valuable advice. . .

"I am prepared to look carefully at the illustrations which have been given, and to see, with the help of my legal friends, whether they are covered. If not, I will consider whether we should make some provision in order to cover them."

At the thirteenth sitting of the Committee on April 15, Mr. Robens referred to the case of those who were employed in the industry as technicians and who came back as directors, and whose directors' fees were part and parcel of their pensions. He indicated that where there were contractual obligations there would be no difficulty under the Clause. If a man had an agreement that his pension was to be £1,000 a year, and received another £1,000 a year as a director, in the event of his directorship being abolished his pension would be £2,000. He was amply covered. *Bona fide* questions of hardship would be examined, and, if necessary, the appropriate alteration would be made.

Mr. Gaitskell expressed his desire to consider "hardship" cases in general.

Mr. Raikes: "I thank the Minister for his co-operation, and beg leave to withdraw the amendment."

On Clause 18, which makes provisions as to undertakers whose gas undertakings only are taken over (*e.g.*, local authorities, composite companies, &c.), the Committee accepted a series of amendments proposed by Mr. Robens to clarify the position in such cases as that of Blackpool, where the Corporation had agreed to dismantle a gas-works and let the railway company have the land. These matters were not, as the clause was drafted, "for the purpose of the gas undertaking," but the amendments made it clear that such arrangements were provided for in the Bill.

Mr. N. Bower (C., Harrow, W.) moved an amendment to provide that questions between the undertakers concerned and the Area Boards should be settled "by arbitration under this Act" instead of "in accordance with the regulations." Mr. Robens said the matter had been carefully considered and they had come to the conclusion that it would be as well if they provided in all cases except local authorities for arbitration, and he undertook carefully to redraft the clause to that effect.

Later in the session, Mr. J. Foster (C., Northwich) moved an amendment that the regulations should provide that questions arising under them should "in default of agreement, be determined by arbitration." Mr. Robens said this matter was outside the scope of the assurance he had previously given. It was the intention, however, to provide for arbitration for composite companies.

The amendment was, by leave, withdrawn.

ASSOCIATION OF TAR DISTILLERS

At the recent Annual General Meeting of the Association of Tar Distillers, the following officers and Executive Committee were elected for the ensuing year:

President: Mr. W. A. Walmsley (Thomas Ness, Ltd.). *Vice-President*: Mr. C. Lord (Lancashire Tar Distillers, Ltd.). *Hon. Treasurer*: Captain C. W. Harriss (Burt, Boulton & Haywood, Ltd.). *Hon. Auditor*: Mr. E. Hardman (E. Hardman, Son & Co., Ltd.).

Executive Committee: The President, Vice-President, Immediate Past-President and Hon. Treasurer, together with W. McFarlane and T. A. Wilson (Scotland); C. Lord and A. E. Brown (N.W. Coast); W. A. Walmsley and J. Colligon (N.E. Coast); A. Bradbury and G. F. Peirson (North Midlands); S. Robinson and W. H. Phillips (South Midlands); S. Roberts and Major A. G. Saunders (London and S.E. Counties); H. H. Bates and Dr. T. H. Butler (South Western); Captain C. W. Harriss and C. F. Sullivan (Wales); E. Hardman (smaller distillers' representative); Colonel W. A. Bristow (low temperature distillers' representative); C. F. Dutton (National Coal Board); and C. E. Carey (co-opted). The Immediate Past-President is Mr. S. Billbrough, of Yorkshire Tar Distillers, Ltd.

TRAINING FILM PROJECTIONISTS

Mr. J. R. W. Alexander attended the passing out tests of trainees from member gas undertakings who have been taking a short course of instruction at Gas Industry House in the handling of 16 mm. film and film projectors. This new service by the British Gas Council has been introduced to assist undertakings to obtain maximum efficiency in arranging film shows and in projecting and maintaining films. In our photograph, Mr. P. J. Lucas, Films Officer, is seen standing next to Mr. Alexander.

PARLIAMENTARY NOTES

by "Abaris"

THE end of the Parliamentary recess found members assembled on April 6 to hear the Chancellor's Budget proposals, and thereafter to debate them.

On April 7 the Member for Kincardine and Western asked the Minister of Food for the average number of main meals served per week to the civilian population respectively, in restaurants, in canteens, and other institutions open to the public, in canteens and other institutions to which access is limited, and in schools. Dr. Summerskill gave the following figures in reply to the question: The average weekly number in restaurants and other catering establishments open to the public, about 32 millions; in canteens and establishments to which access was limited, 16 millions; and in all schools, the number served to day pupils was about 14 millions.

In a written reply to a Member, the Minister of Fuel and Power stated that 47.4% of the total output of saleable coal was mechanically cleaned in 1946; the corresponding figure for the year 1945 was 45.4%. In 1946 about 7% of the total saleable coal output was sold as unscreened coal.

The Minister of Labour gave some interesting figures when he was asked about employment in the coal industry. The questioner asked if the Minister could give the average net monthly increase of manpower during 1947 and in January and February, 1948. In each four-week period of 1947 the average net increase was 2,000; the corresponding figures for January and February, 1948, were 2,500 and 2,000 respectively.

The Member for Kingston wanted to know why the recent letter from the Minister of Labour to wage councils and boards had been withdrawn and if he would publish the terms of that letter. Mr. Isaacs explained that there was a possibility of a misinterpretation of the terms of the letter and it was, therefore, withdrawn. He proposed to circulate another and, in the circumstances, felt that the publication of the first letter would serve no useful purpose now.

The Member for Spen Valley asked the same Minister what training centres were at present operated by the National Institute of Houseworkers; what the training period was; how many domestic workers were trained during 1947, and what the average cost was for training each individual. It was stated in reply by Mr. Isaacs that centres operated at Chilton Cantelo, Oxford, Bridge of Allan, Keighley, and at Swansea; the training period was six months for students over 18 years of age and nine months for those under 18. As no student had completed training during 1947, the Minister was unable to give costs. [NOTE: These centres may be of interest to gas undertakings for it would appear to be a training system in which appliances are used; a likely market for gas.]

The Member for Altrincham and Sale made a long statement on the oil situation and, naturally enough, raised the question of coal-oil conversion schemes. Firms, he said, were urged to convert to oil, and then suddenly 18 months later were asked to convert back to coal, and to bear the cost of the double conversion. Mr. Robens, speaking on behalf of the Minister of Fuel and Power, attempted to explain the position. "My right hon. Friend (the Minister) is doing everything possible to deal with this very difficult problem of oil, and it is not being neglected because of other work and responsibilities in which my right hon. Friend has also a special interest."

During a debate, the Member for Brighton again raised the question of requisitioning the Prince's Hotel, Hove, which has now been taken over by the Electricity Board. At one stage he said: "Everyone will want to know what exactly a board can, or cannot, do." He affirmed that he wanted to point out that the board was slowly taking over property which could be used for other purposes, and he wanted the process to be stopped.

Atomic Power

On April 12, the Member for Portsmouth asked the Minister of Supply what progress had been made in the attempts to harness atomic power for industrial purposes. Mr. G. R. Strauss said that a low energy experimental pile had been in operation at Harwell since August, 1947, and this, together with the larger experimental pile which would come into operation this summer, were the basic tools for the study of the many problems that had to be overcome before atomic energy could be harnessed for industrial purposes. Work was going ahead at the same time on planning alternative designs of experimental piles for power production.

The same Member followed by asking if it would still be five years before it was possible to use atomic energy for productive purposes.

Mr. Strauss: "The consensus of scientific opinion now puts the date rather further forward and it is considered that it will be at least 10 years, and some hold considerably longer, before atomic energy can be used on any considerable scale for industrial purposes."

Another Member asked if the Minister would give the approximate sums spent on atomic research for industrial and war purposes, respectively, but the Minister replied that that was an entirely different question.

The Member for Great Yarmouth asked the Minister of Transport what number of railway wagons was in use in 1939, and the number in use to-day. Mr. Barnes stated that the number of railways owned and requisitioned privately owned wagons was 1,247,800 on Dec. 31, 1939. Of that number, 18,745 railway owned wagons were under, or awaiting, repair. On Dec. 31, 1947, the total operating stock was 1,218,000, of which 160,000 were under, or awaiting, repair. The net figure was, therefore, 1,058,000 wagons available for traffic.

THREE MAY MEETINGS

The Wales and Monmouthshire Association of Gas Engineers and Managers will hold its 43rd annual meeting at the Residential Golf House, Prestatyn, on May 13 and 14. The first day's programme comprises golf and bowls competitions, followed by a dinner at which the trophies will be presented. The business meeting, at which Mr. F. Dupont, Engineer and Manager of the Brecon Gas Company, will deliver his Presidential Address, will be held on the morning of May 14. In the afternoon there will be a mountain motor tour, and the programme will conclude with a social evening at the Residential Club House.

In the following week—May 19 and 20—the Eastern Association of Gas Engineers and Managers will hold its 113th general meeting at Norwich. The first day will be devoted to golf at the Eaton Golf Course, Norwich, and the members and visitors will be the guests of the Directors of the British Gas Light Company at a reception and dance in the evening. The business meeting—including a paper on "Refractory Materials in Relation to the Manufacture and Use of Gas" by Mr. A. T. Green—will be held at the Stuart Hall, St. Andrew's Plain, on the morning of May 20. While the members are thus engaged the ladies will have a choice of visits to the Norwich Cathedral or Norwich Castle. Then comes the Association lunch at Samson and Hercules House, and the programme will end with a cruise on the Norfolk Broads.

Preliminary notice has also been received of the spring general meeting of the Southern Association of Gas Engineers and Managers, to be held at the Connaught Rooms on May 25. The meeting will be preceded by an informal luncheon.

CORNISH ASSOCIATION

"You cannot sheet an idea—you have to overcome it with a better idea," said Mr. Walter Biscoe, C.I.E., of Bristol (formerly No. 2 to the General Manager of the North Western Railway of India), in an address to the Cornish Gas Association at their annual general meeting on Mar. 24. At a luncheon following the meeting Mr. J. C. Cotterill, Engineer and Manager to the St. Austell Gas Company,

Cornish Association

supported Mr. Biscoe. Mr. T. J. Greenwood, Bodmin Gas Company, President of the Association, and Mr. R. J. Williams, Truro Gas Company, welcomed the visitors. Our photograph (by courtesy of the *Western Morning News*) includes Mr. Greenwood (extreme right) and Mr. Biscoe (third from right, front row).

Communications Nos. GRB 36, 37 and 38 are now available from the Gas Research Board. Price per copy, 1s. 6d. (post free).

THE REMOVAL OF HYDROGEN SULPHIDE FROM COAL GAS BY MEANS OF IRON OXIDE*

By G. U. HOPTON, B.A., B.Sc., A.M.I.Chem.E.,

Gas Light and Coke Company.

(*Continued from p.* 111)

GROUND level and sunken boxes have the advantage of cheapness of construction, but require large space to accommodate discharged material and revivified material ready for charging. It is advisable to allow a space for working oxide considerably larger than the ground space occupied by the boxes themselves. Labour requirements are high. Another disadvantage of ground level boxes is the reduced accessibility of valves, and the presence of valve pits which increase corrosion and fire risks. In most ground level systems there are considerable lengths of main below ground, and it is sometimes difficult to ensure adequate drainage of these mains, so that fouling of the gas may occur through the picking up of hydrogen sulphide from dirty water discharged into the mains where logging of valves is practised.

In two-tier systems where the boxes are supported above the ground, the extra ground space required for working oxide may be reduced to about one-half of the area of the vessels, and the material is lifted into the box by hoist or inclined conveyor belt. The highest degree of mechanical handling is found in the three-tier system where the boxes are supported above ground, and an overhead concrete floor is provided to receive revivified material. Very little extra ground space is required for the oxide, so that the three-tier system is particularly suited to sites of limited area. Manual labour is reduced to that of discharging the boxes, moving the discharged material to the elevator, spreading the material on the overhead floor, and charging the box with the aid of chutes; on the other hand, the cost of oxide handling is usually greater than that in the two-tier system because of the increased cost of elevating and spreading on the overhead floor.

An analysis of the costs of oxide purification was carried out in 1934 by H. Hollings and W. K. Hutchison. The results of their comparison of the three systems of purifiers for coal gas are given in the following table:

TABLE 3.—*Comparative Costs of Oxide Purification* (1934)

Purifier type	Ground level	Two-tier	Three-tier
Preparation of oxide ...	Portable crusher	Portable crusher	Disintegrator
Charging of oxide	Hand	Hoist	Elevator
Oxide handling costs		Per ton of oxide moved	
	s. d.	s. d.	s. d.
Charging and discharging...	5 3	1 10	1 10
Preparing	1 0	1 0	2 5
Wear and tear, tools, power	6	9	1 0
	6 9	3 7	5 3
Capital cost			
Per million cu.ft. per day ...	£3,150	£4,200	£5,100
Total costs		Pence per 1,000 cu.ft. of gas	
Oxide handling (6.3 tons per ton S)	0.133	0.071	0.104
Capital charges (8% for 250 days)...	0.242	0.323	0.392
Total	0.375	0.394	0.496
Ground space required			
Sq. ft. per million cu.ft. per day	5,000	3,200	2,200

Costs of new oxide, disposal of spent oxide, and credit for spent oxide, are not included in Table 3.

From this analysis it appeared that the two-tier system was less costly than the three-tier system both as regards capital charges and oxide handling. Ground level boxes were still cheaper because of their simple construction, despite the high labour costs. The trend towards higher wages since 1934, particularly in the last year or two, has probably altered the favourable position of ground level boxes in respect of costs, and the disadvantages of large ground space and inaccessibility of valves are all the more decisive.

In choosing between the two-tier and the three-tier system regard should also be paid to considerations of convenience. The three-tier system provides a covering over the boxes which is an advantage when changing boxes in bad weather, and also protects the oxide in the box from extreme temperature variations in summer and winter. The simplicity of charging the oxide through chutes from a supply of material held ready on the overhead floor enables the complete operation of changing a box to be carried out in the shortest time. In three-tier sets a box can be emptied, filled and put back to work within eight or nine hours, whereas in two-tier sets the work can not usually be completed within one working day, and has to be left overnight. With ground level boxes it is not unusual for the changing of a box to take more than two days.

There is considerable variation in the number and depth of the layers of oxide in purifier vessels. In Britain the usual practice is to provide a total depth of oxide in the box of not more than 4 ft.; this may be in the form of a single layer, or may be divided into two or three layers. The advantage of a single layer of oxide is the saving in wooden grids, which suffer damage when the box is discharged, and need fairly frequent replacing; and the operation of discharging is rendered easier. The disadvantage is the tendency of the oxide mass to pack down in use, and give rise to higher pressure losses than with a number of shallow layers, as well as making the material harder to discharge. The use of two layers each 2 ft. deep is very common. It permits mixing of the gas between the layers, which has the desirable result of reducing the evil effect of unequal flow of gas or difference in efficiency of removal of hydrogen sulphide over the cross-section of the box due to uneven packing or mixing of the oxide, or channelling. American and German practice often favours deeper beds of oxide, which is desirable in that it permits a saving of ground space, but only at the expense of increased pressure loss unless split flow is used. In using deep beds it is all the more necessary to achieve efficient removal of tar and naphthalene from the gas. Deep purifiers have been installed in a number of cases in Britain.

Where simple flow is practised, the gas can be passed either upwards or downwards through the oxide, and there are significant differences in the conditions. With upward flow the gas passes through the spaces in the grids and enters the bottom of the oxide layer. Sulphur deposition is heaviest in the oxide mass immediately over these spaces, and rise in back pressure during working is therefore more acute. The same effect is produced if much moisture is condensed from the gas, or if tar fog is present. The gas leaving the oxide strikes the top cover and then passes out of the box. Consequently condensation of water occurs on the under side of the cover, and when the box is in third and fourth position this moisture drips on to the top surface of the oxide mass (unless the cover is so domed that the water can run to the sides of the box). The danger is not only that the top of the oxide mass can become wet and inactive, but that cases can and do occur where the condensate contains appreciable amounts of ammonium sulphide absorbed when the box was first taker, so that the gas leaving the last taker is contaminated by picking up hydrogen sulphide from the condensate. With downward flow the gas meets the full surface of the oxide layer, so that the effects of sulphur deposition, condensation and tar fog are not so serious in increasing the pressure drop, and the warm gas leaving the box strikes the bottom floor, from which condensate can be drained away. For these reasons downward flow of gas is preferred.

Downward Flow

It has been argued that although downward flow is generally preferable, it is better to use upward flow with gas containing appreciable amounts of tar fog—for example, carburetted water gas. It is suggested that in such cases the oxide serves to filter out the tar fog, and the tar can drain more readily from the oxide when it is deposited at the bottom of the layer. This is doubtless true, but the proper remedy appears to be to take adequate steps to remove the tar fog before the purifiers, and then to use downward flow. In any case, even when tar is present there is something to be said for downward flow, because the top of the oxide can be dug over or replaced to relieve excessive back pressure, without disturbing the whole of the oxide in the box.

Rotation, which is necessary in order to secure the utmost advantage from the reactions of sulphiding and oxidation, which proceed simultaneously but at different rates, has naturally a levelling effect on the temperature of the boxes, which is very desirable, because otherwise the first taker would become too hot and would dry out and become inactive, while the last taker would be cold and sodden with moisture, and also inactive. But despite the exothermic nature of the reactions of sulphiding and particularly of oxidation, heat losses from the system are considerable because of the very large surface area of the sides and covers of the boxes. The heat losses depend on the construction of the boxes, being least in sunken boxes and greatest in cast iron elevated boxes, and vary also with the atmospheric conditions. In cold weather the heat losses may be so great that the temperature of the oxide mass in the third and fourth position becomes too low for efficient working, especially if the hydrogen sulphide content of the crude gas is low. For this reason it is advisable to install heaters. Unfortunately it is simplest to install a single heater in the inlet main to the purifier set, where it may do more harm than good. It is not the first taker which requires heating (except occasionally in the first few hours after being swung into position), but the third and fourth,

* Paper to the Southern Association of Gas Engineers and Managers (Eastern District) Mar. 30, 1948.

and excessive use of such a heater in order to overcome the heat losses from all the boxes and make an appreciable difference to the last taker results in drying out the first taker to such an extent that caking and loss of activity occur. The proper arrangement is to provide separate heaters in the main inlet of the set and in each bridle main, and possibly as a further precaution to make provision for rehumidifying warmed gas should this prove desirable, as described by J. Castle (22).

In very cold weather, especially when gas containing low concentrations of hydrogen sulphide is being treated, or where heaters are used, it is desirable that radiation and convection losses to the atmosphere should be reduced. Losses are much less with concrete boxes than with cast iron, which is one reason for preferring concrete construction. The heat loss from the mild steel cover is, however, large, and proposals have been made for insulating the cover. On the other hand, it may be desirable in warm weather and with gas containing a high concentration of hydrogen sulphide to allow as much atmospheric cooling as possible. Some form of removable insulation is therefore preferable, which can be laid on the cover as required.

A recent development in the design of purifiers is the use of tower purifiers. The Thyssen-Lenze tower purifier was developed in Germany, and a plant of this type was installed at Wandsworth in 1938. The installation, which has a nominal capacity of 10 million cu.ft. of gas per day, consists of six towers, together with a stocking tower and stocking frame. Each tower consists of an outer shell 22 ft. in diameter by 52 ft. high, containing 12 superimposed polygonal containers each holding two layers of oxide on wooden grids, with a central tube. When the containers are placed one above the other in the tower, the central tubes form a common gas inlet to the containers. Gas from the central tube enters through slots into the space between the two layers of oxide in each container, divides and passes through the layers of oxide, and escapes to an annular space between the walls of the containers and the shell of the tower. The outlet main is taken from half-way up the side of the tower. An electrically-operated overhead crane is provided for handling the containers. The plant has been described by C. M. Croft (23). The operation of the plant has been described also by R. J. S. Thompson (24). The six towers are connected in series and are operated in backward rotation. The purification material first used consisted of a mixture of 70% Dutch bog ore and 30% Lux, the first three towers being charged with part-spent material of this composition, while the last three towers were charged with new material. The total volume of oxide charged corresponded to 6.6 cu.ft. per 1,000 cu.ft. of gas per day (as compared with 8 for normal purifiers based on a cross-section of 0.5 sq. ft. per box and 4 boxes each containing 4 ft. depth of oxide). Air was admitted with the gas so that the outlet gas contained 0.4 to 0.5% of oxygen, and the temperature of the inlet gas was kept above 68° F., while the temperature in the towers was not allowed to rise above 110° F.; in order to maintain these conditions cast iron radiators are installed in the bottom of each tower. When the oxide in a tower is to be changed, the tower is isolated, purged, the cover removed, and the containers lifted out. The oxide can be worked up from 2-3% to over 45% of sulphur in one exposure. Later experience with artificial oxides has been satisfactory.

Labour requirements are much the same as those for ordinary box purifiers, but the use of the containers enables the work to be spread evenly over the year, in contrast to box purifiers which require a large labour force for short periods. The installation cost of tower purifiers is stated to be less than box purifiers for large installations, and the operating costs of tower purifiers are estimated to be about one-half of those of box purifiers. The greatest advantage of tower purifiers is the much reduced ground space.

The Operation and Control of Purifiers

Bog ore has the advantage of possessing a texture suitable for purification without admixture with other materials, provided that it is sufficiently dry. With the PH adjusted to 7-8, new bog ore may then be charged alone; but it is more usual to mix it with part spent material to give a charge containing 15-20% of sulphur. This practice of mixing allows new bog ore of higher moisture content to be taken into use, and has advantages if the material must be reduced in size, as the mixture is more readily treated in a disintegrator. Lux cannot be used alone for two reasons—namely, its high reactivity and finely divided state. It is usually mixed with bog ore, sometimes with the addition of wood shavings or coarse sawdust. One advantage of Lux is its alkalinity, so that it is particularly suitable for mixing with acidic new bog ore or part-spent material.

Precipitated iron oxide obtained as a by-product in industry varies widely in nature according to its source, and experience with it has varied widely too, sometimes unhappily. Such oxide may be dry and finely divided, or gelatinous, and it may contain other chemical substances such as calcium chloride or sulphate. In many cases by-product iron oxide consists substantially of α-$Fe_2O_3.H_2O$ and is suitable for gas purification, particularly if it is in the form of a powder, when it may be treated like Lux. If the material is wet and sticky, it requires careful preparation. Air drying may make little improvement, especially if the material is contaminated with calcium chloride; the mass is then best mixed thoroughly with an equal weight of dry part-spent oxide, possibly with the addition of wood shavings or coarse sawdust, and then mixed with the rest of the charge to give a product containing, say, 5% by weight of the sticky material.

The use of by-product ferrous sulphate (copperas) is common, but failure to appreciate the chemical changes involved may lead to difficulties. Purification is effected by ferric oxide; not by ferrous hydroxide, as an unfortunate incident with a synthetic mixture containing much recently-mixed copperas and lime as a black gelatinous unoxidized hydroxide clearly showed; nor by ferrous sulphate, as the presence of unchanged lumps of green copperas in a used charge of badly mixed material indicates. It is necessary, therefore, to neutralize copperas and to leave the mixture exposed to air until all the copperas has been converted to ferric oxide. In some cases copperas has been mixed with peat and the calculated quantity of soda ash or slaked lime, and allowed to react fully before being mixed with part-spent oxide or other material. It is less laborious to carry out the mixing in one operation by the "sandwich" method, or by passing the ingredients through a crusher or disintegrator in small aliquot portions. There is no doubt that thorough mixing of oxide charges is one of the most important features of the use of iron oxide, and that failure to ensure it is the cause of much trouble. It is doubtful if the common expedient, when bucket elevators are used, of bringing the various constituents of a mixture to the elevator in an orderly sequence in wheel-barrows, is sufficiently effective.

Fortunately the need for thorough mixing, and also for adequate turning over of discharged material, is becoming more generally recognized. On some works use is now made of mechanical cultivators. In the smaller sizes these machines are petrol driven, and are worked by one man in very much the same way as one guides a motor lawn mower. In the larger sizes the machine may consist of a rotary hoe cultivator drawn by a small tractor. The material is spread out, preferably on a concrete floor, to a depth of 9 in. and the machine is driven through this shallow bed at a low speed. In this way large lumps are broken up, the material is turned over, and well mixed. Equipment of this kind is suitable for all but the smallest works, where, owing to the small volume of oxide handled, really thorough mixing by hand is practicable.

Use of Burnt Oxide

The chemical nature of burnt oxide has already been described. It is relatively inactive, and very finely divided, so that care must be taken in its use. It contains small and varying amounts of ferrous sulphate, which should be neutralized before charging; and additional copperas and alkali may be added to increase the content of α-$Fe_2O_3.H_2O$. Burnt oxide must be used with the addition of other forms of iron oxide. For example, G. Dougill (25) has described the use of charges made up in the proportion of 20 cwt. of burnt oxide, 3 cwt. of soft wood sawdust, 2 cwt. of copperas, 1 cwt. of slaked lime, and 55 gall. of water. Soda ash may be substituted for lime. Fairly satisfactory charges result from mixing burnt oxide preparations with part-spent oxide and new bog ore, for example, in equal amounts. It must be admitted that burnt oxide is not a superior form of purification material, but there is often an economic reason for using it.

In most charges containing Lux, artificial by-product oxide, or burnt oxide it is advisable to incorporate a "lightening agent" to prevent packing down and caking in the box, and to provide an open texture for gas flow, sulphur deposition, and drainage of moisture. The use of sawdust has been mentioned above, but as Dougill points out, if the material is too fine it is not suitable; chips or short shavings are more satisfactory. An excellent lightening agent is peat, either in the form of granulated peat moss or peat tailings, the former giving less pressure loss. The peat should be teased out to a packing density of about 20 lb. per cu.ft. The proportion of peat used in oxide mixtures should not be too high, for although the mixture can be fouled to contain the same proportion of sulphur by weight as mixtures of oxide alone, the lower packing density of mixtures containing much peat means in effect that a smaller volume of gas is purified by the charge. The proportion of peat should therefore not exceed 25% by volume, or 10% by weight. If such a mixture is fouled and then used as part spent oxide for mixing with new oxide, it must be remembered that this part spent oxide itself contains a proportion of peat, so that less peat should be added to the mixture, otherwise difficulty may be experienced because of the reduced capacity of the boxes. One advantage of peat is its tolerance of water, so that considerable amounts of water can be taken up without the material becoming sodden.

In the section on the reactions of sulphiding and oxidation the importance of the PH of the oxide mixtures has been emphasized. Oxide discharged from a box is usually acidic, and although, as described previously, material may remove hydrogen sulphide down to the legal limit when its PH is below 7, yet the harmful effect of souring is so well established that it is important to raise the PH of the discharged material to just over 7 before re-charging.

The importance of adjusting the moisture content of oxide is generally understood. With regard to particle size, laboratory experiments with part-spent oxide indicate that material below 0.025 in. is more efficient than larger sizes. Unfortunately, material below 0.025 in. is responsible for most of the pressure loss in the purifiers. Little is known of the size analysis of oxide after treatment in crushers and disintegrators, and the subject would repay study. It is probable that material between 0.1 and 0.025 in. is the most useful size, but that most machines give only 50% by weight of this size, 25% being larger than 0.1 in. and thus low in efficiency, while 25% is smaller

than 0.025 in. and thus causes high pressure loss. Care spent on the screening of charges may be well repaid.

The importance of efficient removal of tar fog from the gas before the purifiers has often been stressed. It is suggested that naphthalene and light oils have a deleterious effect on oxide, and that naphthalene removal by oil washing should be carried out early in the stream so as to protect the ammonia washers as well as the oxide purifiers.

Hydrogen cyanide is partly removed in the purifiers, the concentration in the gas being reduced by about 80%, for example, from 40-70 grains per 100 cu.ft. to 10-15. The hydrogen cyanide absorbed is transformed chiefly into blue, and to a lesser extent into ammonium thiocyanate. It appears that high concentrations of ammonia in the gas cause a reduction in the blue content of the oxide and an increase in thiocyanate. Because of the corrosive action of thiocyanate on the metal work of purifiers, and the desire in many cases to obtain a high content of blue in spent oxide, it is advisable to maintain the concentration of ammonia in the gas at a low level. On the other hand, some ammonia should be present because of its beneficial effect on the oxide material in reducing the tendency to become acid in use, and it is generally agreed that a suitable concentration of ammonia in the gas entering the purifiers is 5 grains per 100 cu.ft. Excessive ammonia may also result in some ammonia passing unabsorbed through the purifiers and interfering with the working of the gas drying plant, and may lead to "throwing off" in the last box.

Addition of Air

Proposals have often been made that the air for purification should not be added wholly or even at all at the inlet of the first box. H. J. Patching (27) recommended that the air should be admitted at the inlet of the second box so as to avoid local temperature rise. Second-box air admission is practised successfully by at least one large company. H. Hollings and W. K. Hutchison (28) found that when all the air is admitted at the inlet of the first box, 90% of the hydrogen sulphide is removed in that box, and 60% of the total oxygen absorption in the purifiers. In consequence by far the largest temperature rise occurs in this box. By admitting the air to the second box an appreciable levelling of temperature in the boxes is obtained. The effect is even more marked if the air admission is divided between the first, second, and third boxes, which is easily done without extra piping or valves if provision has been made for admission of air to the second box. But inter-stage air admission seems to be less efficient in the removal of hydrogen sulphide. Experience by Dr. A. E. Haffner in one of the works of the Gas Light and Coke Company of six months' working in which 22% of the air was admitted to the first box, 51% to the second box, and 27% to the third box gave a striking reduction in the temperature fluctuations in the boxes, but resulted in an increase of 100% in the concentration of hydrogen sulphide in the outlet gas, as compared with the normal practice of adding all the air to the first box. A decrease in the efficiency of removal of hydrogen sulphide is perhaps to be expected with interstage air admission, because at any instant there is less oxide and more sulphide present in the set as a whole. It appears that the advantage gained by keeping the third and fourth boxes warmer does not always outweigh this decrease in the relative proportion of oxide to sulphide.

The advantage of maintaining the temperature of the gas at about 90° F. in normal practice is however well known, and H. B. Avery (26) in discussing this fact has pointed out that the heat of reaction is sufficient to maintain the boxes at a satisfactory working temperature provided that heat losses are kept low. In unlagged purifiers, with the exception of those sunk in the ground and those housed in a building, it is unfortunately necessary to provide heaters, and the subject has been mentioned previously. Exact data on the relation between rates of reaction for sulphiding and oxidation, and temperature, are not available, but so far as is known the reactions are favoured by rise in temperature up to the point (about 45° C.) at which decomposition of $Fe_2S_3.H_2O$ begins to occur. Thus 104° F. represents the highest safe temperature in the oxide mass, and since the mass may contain portions considerably warmer than the gas leaving the mass, it is advisable not to exceed 100° F. for the temperature of the gas. The highest temperature rise (with first-box air admission) is attained in the first box, and with gas containing high concentrations of hydrogen sulphide the safe limit may be exceeded. This fact is probably of the greatest importance, and explains the difficulty in the purification of gas containing large amounts of hydrogen sulphide. It may be said that oxide purification is fundamentally unsuited for gas containing high concentrations of hydrogen sulphide, and when such gas must be treated, there is little remedy but the most efficient cooling of the gas before the purifiers, and frequent rotation of the boxes, with the use of moist charges containing peat.

Reference has already been made to the use of humidifiers coupled with heaters (22). Humidity effects in oxide purification are discussed by C. G. Milbourne and W. J. Ruff (29), and W. A. Dunkley and C. E. Barnes (30). Fine control of the moisture content of the oxide in the boxes is not possible in the usual design of purifiers, which seldom possess interstage heaters; and in any case, whatever steps are taken to add water vapour to the gas, there remains the uncertainty as to what is the effect on the oxide in the box, owing to the impossibility of sampling it adequately during working. There is considerable discharge of water from a set in operation, averaging about 1 gall. per ton of coal carbonized, and oxide nearly always loses moisture during its working life in a box, despite the water set free by the reaction. There are fluctuations in moisture content as the box is rotated. The following table gives the average gas temperature throughout a set of elevated concrete purifiers during four periods, the boxes being swung every third day.

TABLE 4.—*Average Gas Temperatures in Purifiers*

Weather conditions :	Very cold	Normal winter	Normal summer	Very warm
Position	Gas temperature °F.			
Inlet of first box ...	44	55	66	75
Inlet of second box ...	68	75	87	97
Inlet of third box ...	60	74	85	93
Inlet of fourth box...	52	68	80	89
Outlet of fourth box ...	39	56	73	80

These figures indicate that moisture is removed from the box in the first position, and gained in subsequent positions. By taking account of the moisture changes due to the reaction, the changes in water content of the boxes are calculated to be as follows:

TABLE 5.—*Moisture Changes in Boxes*

Weather conditions :	Very cold	Normal winter	Normal summer	Very warm
Box	Tons of water in 72 hours			
First box, removed ...	0.35	0.68	1.16	2.31
Second box, deposited ...	0.74	0.29	0.35	0.86
Third box, deposited ...	0.38	0.48	0.42	0.55
Fourth box, deposited ...	0.77	1.03	0.71	1.25
Overall, deposited	1.54	1.12	0.32	0.35

The working conditions during these periods were as follows:

TABLE 6.—*Working Conditions for Data in Tables 4 and 5*

Weather conditions :	Very cold	Normal winter	Normal summer	Very warm
Gas rate, cu.ft. per hour ...	101,000	89,000	67,000	70,000
H_2S in gas, grains per 100 cu.ft. :				
(*a*) Inlet of first box ...	485	520	538	500
(*b*) Inlet of second box ...	40	90	80	80

In each case it is assumed that 60% of the total oxygen absorption occurs in the first box, 20% in the second box, and 20% in the third box, this oxygen absorption being that required for the oxidation of the hydrogen sulphide.

The weight of oxide in each box was 140 tons, so that from the above calculations it appears that in a normal winter each box would gain 0.8% of water in each cycle of 12 days, or about 10% during its life in the box of 13 cycles. But the analysis of the oxide showed that the oxide lost 8% of moisture between charging and discharging. Thus water equivalent to 18% of the weight of oxide must have drained away from the box during its life. There is reason to believe that these large moisture changes in the box have a deleterious effect on the activity of the material, and on the tendency to cake.

A. Pott, H. Broche, and H. Thomas (31) recommended passing the gas into the first box at substantially atmospheric temperature, and then raising the temperature of the gas to 40-50° C. (104-122° F.) in the succeeding boxes by means of heaters and humidifiers. This "cold-warm" process has not found wide application. It will be seen from the table above that these conditions are nearly approached in normal operation during very warm weather; but considerable heating would have to be applied in winter.

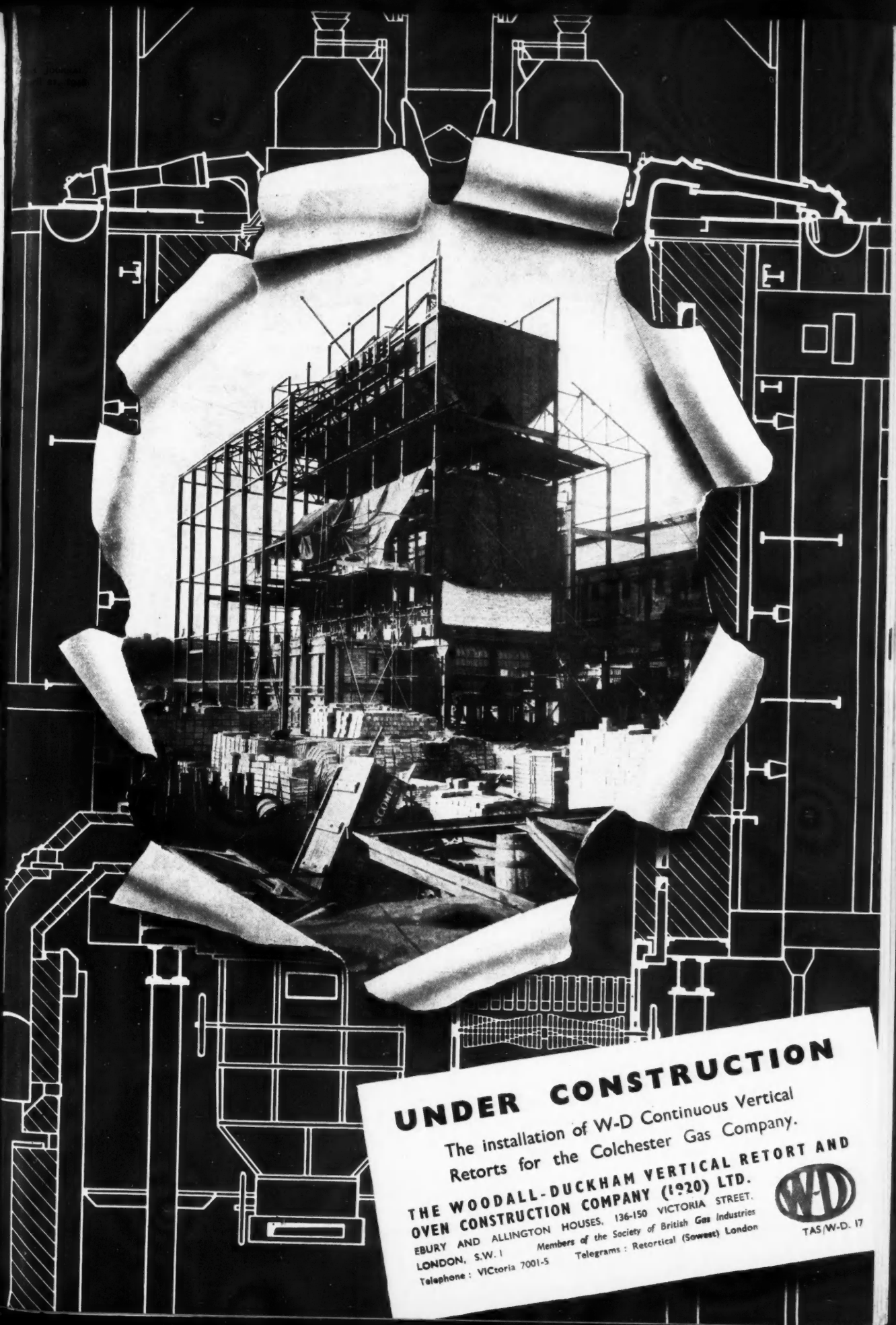
The degree of removal of hydrogen sulphide in the purifiers is affected by the gas rate. In laboratory experiments on a small scale, where heat losses are relatively high and the temperature of the oxide is not appreciably altered by the gas rate, it is found that the efficiency of removal of hydrogen sulphide decreases with increasing gas rate, the relation being

$$\frac{\log S}{\log S_1} = \left(\frac{V}{V_1}\right)^{-0.6}$$

where S is the slip, defined as the ratio of the concentration of hydrogen sulphide in the outlet gas to that in the inlet gas, at the gas rate V, and S_1 is the slip measured at the gas rate V_1. This relation indicates that if purifiers reduce the concentration of hydrogen sulphide in gas from 600 grains per 100 cu.ft. to 0.1 parts per million, that is, S = 1/100,000, then the concentration in the outlet gas would rise to 1.2 parts per million if the gas rate were increased by 50%. In works practice such an increase in slip may not be observed, because of the higher temperature of the oxide at the increased gas rate, which may have a beneficial effect. It is often good practice (although it requires courage) when a set of purifiers is working badly due to low temperatures in the boxes, to increase deliberately the gas flow through the section.

Small-scale laboratory tests show that at a given gas rate the slip is independent of the hydrogen sulphide content of the inlet gas thus if the content in the crude gas rises by 50%, the concentration of hydrogen sulphide in the outlet gas should rise by 50%. But here again the temperature effect in the boxes may give rise to behaviour in works practive quite different from that in laboratory experiments. The rise in temperature of the oxide in the purifiers with gas of high hydrogen sulphide content may have deleterious effects on the performance of the material due to the decomposition of $Fe_2S_3.H_2O$.

The occurrence of a large number of chemical reactions in the purifiers has been postulated, for example by R. H. Clayton, H. E. Williams, and H. B. Avery (32). Among the reactions which take place



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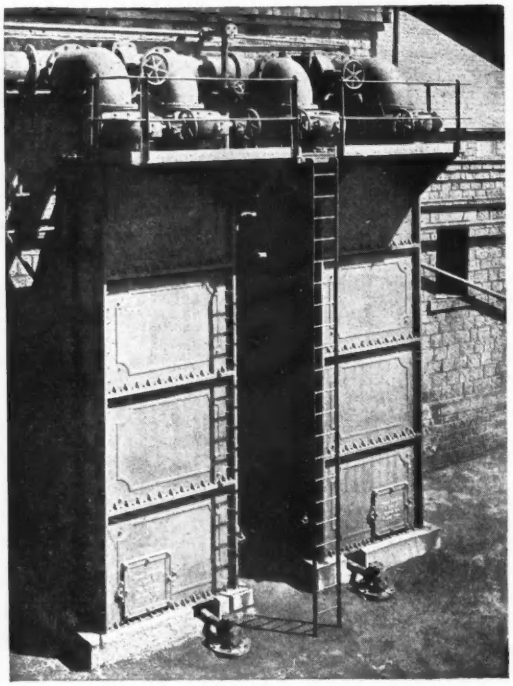

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is the absorption of nitric oxide from the gas (K. Bunte (33)), a phenomenon which is of importance in connexion with the occurrence of gum in distributed gas (H. Hollings (34)).

The reasons for employing backward rotation in purification are well known. Observation has been carried out of a charge of oxide during the whole of its working period in a box. The results may be summarized as follows: In first position the performance of the box decreased rapidly from day to day in any one cycle, and further, the efficiency fell from cycle to cycle. In contrast to this behaviour, the removal of hydrogen sulphide as second taker improved from day to day in any one cycle. In third position the charge behaved as if there were a limit below which the hydrogen sulphide content of the gas was not reduced; thus if the gas entered the box with a low concentration of hydrogen sulphide, the percentage removal was small compared with that obtained when a higher concentration entered the box. In fourth position the same phenomenon was observed, with the added complication that hydrogen sulphide was occasionally evolved from the box.

From these and other detailed observations of the performance of charges it is considered by H. Hollings and W. K. Hutchison (28) that the hydrogen sulphide and oxygen absorption in four boxes worked in backward rotation with changes at intervals of one to five days may be represented by the following table:

TABLE 7.—*Absorption in Purifier Boxes*

	Hydrogen sulphide in gas Grains per 100 cu.ft.	Oxygen in gas % by volume
Entering first box	550	1.2
Entering second box ...	25	0.9
Entering third box... ...	0.5	0.8
Entering fourth box ...	0.01	0.7
Leaving fourth box ...	0.001	0.7

These figures give a broad picture of the average behaviour of the boxes, and agree with the findings of C. J. H. Madsen (35) and Rettenmaier (36). It will be seen that 95% of the hydrogen sulphur removal and 60% of the oxygen absorption occur in the first box. Most of the remaining hydrogen sulphide is removed in the second box, the final traces being absorbed in the last two takers. 20% of the oxygen absorption occurs in each of the second and third boxes. The oxygen absorption in the last box is very small but is probably significant. These conclusions show the importance of rotation in preventing excessive fluctuations of temperature, and in giving each charge the opportunity to undergo oxidation in the later positions.

Frequency of Rotation

There is considerable variation in the frequency of rotation practised. Where adequate chemical supervision is available, the boxes may be swung according to the degree of removal of hydrogen sulphide. It is, however, quite common to swing the boxes at fixed intervals, in some cases as frequently as every 12 or 24 hours, in other cases as infrequently as every five days or even longer, the only exceptions being when failure of a box occurs. It is believed that frequent rotation is an advantage in that it reduces fluctuations in temperature and therefore in moisture content, and so minimizes loss of activity of the oxide, and the tendency to cake during use. On the other hand, frequent changes demand more attention, especially where the tightness of the valves is questionable. A period of 24 to 48 hours seems a desirable compromise.

As is clear from the results for the working of a box, the percentage removal of hydrogen sulphide in the second, third and fourth position can not be used as a means of watching the deterioration of the charge during its life in the box. It is suggested that the behaviour is best followed by determining the percentage removal of hydrogen sulphide when the box is first taker. The average figures for each month in the life of several charges are given in the following table, together with information as to the composition of the oxide.

TABLE 8.—*Removal of Hydrogen Sulphide by Charges*

Composition of Charge % by weight	Analysis of Oxide S, % dry basis Ph In	Out	% Removal as 1st Taker Monthly Averages In	1	2	3	4	5	6	Mean
84 M, 8P, 7½C, ½L ...	47	53	7.8	95	89	83	89	—	—	89
92M, 5C, 3L	48	55	8.0	85	89	83	87	—	—	86
87M, 6C, 4P, 3L ...	47	57	7.0	94	94	91	73	—	—	88
99½M, ½L	52	57	6.0	82	81	75	77	67	—	75
65½M, 30Ir, 2½C, 1½L ...	43	50	6.5	85	81	79	79	—	—	81
65½M, 30Ir, 2½C, 1½L ...	26	47	7.2	96	86	74	90	90	—	87
68M, 25Ir, 4½C, 2½L ...	32	44	7.0	91	85	89	85	81	—	86
52M, 40Ir, 3P, 3C, 2L ...	37	55	7.0	94	94	93	96	84	72	89
34M, 33Ir, 25B, 3C, 2S, 3P	20	38	7.2	91	95	89	86	—	—	90
71M, 25Ir, 2½C, 1½L ...	31	58	7.5	94	89	78	78	76	66	80
67½M, 30Ir, 2P, ½L ...	36	50	8.0	92	81	80	77	82	81	82
60M, 25Si, 15Ir	32	45	6.5	93	91	90	89	76	—	88
60M, 25Si, 15Ir	39	47	7.0	91	88	83	83	75	72	82

In Table 8 the following abbreviations are used : M, Part spent oxide. P, Peat. C, Copperas. L, Slaked lime. Ir, New Irish bog ore. B, Burnt oxide. S, Soda ash. Si, Siliceous iron oxide ore.

These figures are not intended to demonstrate the relative superiority of any oxide composition (for which purpose more information would be necessary) but only to serve as an indication of the drift in efficiency throughout the life of a charge. It will be seen that in general the efficiency as first taker is about 91% during the first month, falling to 84% in the fourth month. Several considerations, such as seasonal load, availability of labour, increase in the back-pressure of a box, or the expected caking of the oxide, are taken into account when deciding on the best time to discharge a box; but in general it may be said that a charge should not be left in when its efficiency as first taker has fallen to 80%. A box which passes a high proportion of hydrogen sulphide affects adversely the whole set, because the second box becomes overloaded and after a while loses efficiency; hydrogen sulphide in appreciable quantity then persists throughout the third box. Even if the fourth box is able to reduce the hydrogen sulphide leaving the third box to a safe limit, there may be considerable difficulty in avoiding contamination of the district when the boxes are swung.

Attempts to restore the efficiency of a box by admitting a high proportion of air must be carried out with caution. With charges in good condition it should not be necessary to increase the oxygen content of the gas leaving the purifiers above 0.6 or 0.7%. With material of exceptionally high activity it is possible to work at 0.3%. If more oxygen is present, there is the danger that too high a porportion of the oxidation will occur in the first box, leading to a rise in temperature of the oxide which may bring about the undesirable decomposition of $Fe_2S_3.H_2O$ into Fe_2S_3, FeS_2, and Fe_8S_9, so that the oxide becomes still more inactive, and also becomes acid. If the other boxes of the set are behaving well, then it is not the conditions which are at fault, but the actual oxide in the box, and it is advisable to discharge the box and examine the material for moisture content, iron oxide content, sulphur, acidity, activity and capacity, and physical state.

The method of attack is quite different when failure of the set occurs owing to evolution of hydrogen sulphide (" throwing-off " or " after staining "). This phenomenon of contamination of the gas after it has been satisfactorily purified is probably far more common than it is thought to be. The very first step is the obvious one of establishing the facts. It is essential to be certain that the gas entering the last taker, or leaving the bed of oxide in the last taker, is really low in hydrogen sulphide, and that the gas leaving the set contains more hydrogen sulphide; this can be done only by accurate determination, using the disc test described by H. Hollings and W. K. Hutchison (28). It is then necessary to determine exactly where the hydrogen sulphide is picked up. The gas must be sampled immediately where it leaves the oxide in the last taker. For example, with upward flow it is a simple matter to insert a glass tube through the cover so as to sample the gas a few inches above the surface of the oxide bed, preferably in more than one place; with downward flow it is possible in many cases with elevated boxes to insert a glass tube in the outlet main of the last taker, and to push the glass up until the end is as near as possible to the grids. If the box is fitted with an outlet chamber, as is the case with many ground level boxes with upward flow, then the gas can also be tested immediately after this chamber. If the main from the box to the outlet of the set is long, or has sections of U-shape, or where liquid might accumulate, tests should be made at suitable intervals along it.

Maintenance of Cleanliness

In many cases it is found that the gas leaving the oxide in the last taker is clean, but that hydrogen sulphide is picked up at some point in the outlet connexions. In the case of outlet chambers, this is due to the presence of spent oxide and dirty liquor which have collected at the bottom of the chamber and not been thoroughly cleaned out. The chamber should be covered by a board when the box is emptied and filled, and condensation should be watched. Similarly, with downward flow a dirty floor, due to failure to move the grids and clean the floor thoroughly when the oxide is being changed, and to inadequate draining of water deposited on the floor, can cause contamination of the gas. Sections of main which are not completely drained, due to faulty laying or slackness in attending to the drainage points, may give rise to hydrogen sulphide evolution, more particularly when the valves are logged as a precaution on closing, because in that case water is sometimes discharged into the mains when the valves are opened. In all these cases the troubles are due to the fact that rotation of the boxes brings the surfaces in contact with foul gas at one stage of the cycle, so that the liquid absorbs hydrogen sulphide, which is given off at another stage. The persistance of an appreciable partial pressure of hydrogen sulphide over such liquor, even when it has passed through the stages of second, third and fourth taker, is favoured by low concentrations of oxygen in the purified gas. If it is definitely established that the gas leaving the surface of the oxide in the last box is satisfactorily purified, but that hydrogen sulphide is picked up during the passage of the gas to the next plant (for example, the meters), then cleanliness must be maintained. Outlet chambers can be scooped out, rinsed, and if desired, given a coating of lime wash; mains can be rinsed out with water followed by zinc acetate solution; the floors of boxes can be scraped and hosed.

In other cases of contamination in upward flow it is found that although the greater part of the oxide in the box is working satisfactorily, certain portions of the oxide surface are evolving hydrogen sulphide. These portions are sodden due to condensed water dropping on to the surface from the cover. If, for example, the cover is flat and is composed of plates riveted together, condensate collecting on the underside of the cover may drip from the rivet heads, giving a narrow band of sodden oxide below the line of the rivets. If the cover is domed, the condensate will run to the sides. It may be harmless where water lutes are used; but with dry lutes the water will run down the sides of the box and give sodden oxide in contact with the walls. The sodden oxide is black, and if a sample is collected immediately the

cover is lifted (the box being last taker) and taken in an air-free bottle to the laboratory, it will be found to evolve hydrogen sulphide when purified gas is streamed through it; it consists of ferric sulphide soaked with a dilute solution of ammonium sulphide. One striking example of this type of contamination occurred on one of the works of the Gas Light and Coke Company in a box with upward flow, where the gas was collected in a narrow rectangular metal trunk running horizontally across the vessel above the bed, with two openings on the top near the ends for the gas to enter, and a connexion to the outlet main at the middle in the bottom of the trunk. The bottom of this trunk was found to be covered to a depth of a few inches with a black sludge of oxide and liquor which had fallen or been blown into the box through the two openings.

It appears that phenomena of this nature are most marked when the gas entering the purifiers has a high content of ammonia, for the liquid comes substantially to equilibrium with the ammonia in the gas when the box is first taker, and with a higher ammonia content the liquid absorbs more hydrogen sulphide. It is, further, natural that evolution of hydrogen sulphide in this manner is more marked in warm weather than in cold, for the partial pressure of hydrogen sulphide over the liquor will increase.

Explanations other than those suggested above have been proposed for the evolution of hydrogen sulphide. For example, it has been suggested that the phenomenon is due to reaction between carbon disulphide and ammonia, or that bacterial action is responsible. It is doubtful whether the temperature in the last box is so high that chemical reaction of carbon disulphide and ammonia becomes appreciable. Evidence has been presented by W. F. Thorne (37) that old sawdust used in purification mixtures can produce hydrogen sulphide from carbon disulphide, while bog ore can produce hydrogen sulphide from the sulphur contained in it, or more rapidly from carbon disulphide. This possibility must therefore be borne in mind, but the action should be readily distinguishable from the mechanism of contamination by condensate, because in the case of bacterial action the whole of the charge should be active in producing hydrogen sulphide. These arguments show how important it is to test the gas leaving the bed of oxide in the last taker, if possible at several places.

Leakage Through Valves

There is another mechanism of contamination which should be considered before any explanation of throwing-off is sought, namely, leakage through valves. If the crude gas inlet valve on the last taker lets by, some crude gas enters the box, and if the leak is large, the concentration of hydrogen sulphide leaving the last box may be adversely affected. If the bridle valve lets by, the position is more serious, for any leakage is transmitted directly to the clean gas. Valve leakage may be tested by sampling the gas between the valve and the box. In the case of the inlet main, the sample should have the same hydrogen sulphide content as the gas leaving the third taker; in the case of the bridle main, the concentration should be equal to that in the gas leaving the fourth taker. Any appreciable difference indicates leakage. One more possibility of leakage must be mentioned, namely, by-passing of the oxide due to leakage at the joint in the standpipe (the inlet main in downward flow, or the outlet main in upward flow). The same loss of efficiency occurs from channelling due to unsatisfactory mixtures, faulty filling, or local action during working (as, for example, the effect of condensate running down the walls, and the wetted oxide shrinking back). These forms of by-passing are sometimes detected from the reduction in the back-pressure of the box, and they are distinguishable from throwing off in that they affect adversely the performance of the box in every position.

If, despite every care in choice and preparation of oxide, maintenance of gas conditions, attention to valves, and regular observation of performance, a set of purifiers fails to reduce the hydrogen sulphide in gas to a safe figure, and no immediate improvement can be effected by changing a box, there are several steps that can be taken. As a temporary measure during the emergency, more air may be added to the gas, and the ammonia content may also be increased for a short time by permitting a higher slip from the washers. Heaters may be brought into increased use during cold weather; but in contrast to this, if the trouble is due to evolution from condensate, the covers of the last taker may with advantage be cooled by hosing with water in very warm weather (and in this case the ammonia must on no account be increased). If these measures are not successful, relief may be obtained by lifting the cover of a box, shovelling out the top layer to a depth of about 1 ft., and replacing it with the best oxide available on the works. When all attempts to reduce the hydrogen sulphide content of the purified gas are fruitless, as for example when poor oxide material has been unavoidably charged, then in order to avoid a shut down the gas drying plant can be used to remove the last traces of hydrogen sulphide. All or some of the bays of the washer are drained, according to their construction; fewer bays are required for hydrogen sulphide removal than for the drying of gas, but it is not always possible to divide the washer so as to carry out purification and partial drying in the same washer. The bays are then rinsed out with water, and charged with zinc acetate solution of 1% strength by weight. This solution is kept in the bays until it is exhausted, when it is discarded, and a fresh batch introduced. The process is very successful in treating gas containing one or two parts per million of hydrogen sulphide, but the cost of treating gas containing several grains per 100 cu.ft. would be excessive.

The maintenance of the oxide "in good heart" depends to a large extent upon the proper treatment of part-spent material discharged from a box. Oxide should on no account be discharged from the box in any other than the last position, firstly because of the danger of fire or explosion, secondly because of the evil effect of the rise in temperature caused when sulphide is exposed to the air. Even when the box has been worked as last taker for 24 hours before discharging, there is still some sulphide present, as is shown by the tendency of the discharged material to become warm; and this tendency is more acute when the set is behaving poorly so that an appreciable concentration of hydrogen sulphide is present at the inlet of the last taker. The discharged material should be spread out, and turned over on several occasions, so that air can act on all the mass, and heat can be lost to the atmosphere. It is useless to discharge oxide into a heap, leave it untouched for days, and then to re-charge it. In the event of excessive heating of the material after discharging, it should be judiciously watered with a fine spray; but if the material starts to burn, the fire is best put out by smothering with fine oxide.

One of the most trying problems in purification in view of the present labour shortage is the caking of oxide. This caking is associated with the formation of sulphur as is shown by the fact that caked material readily disintegrates when it is immersed in carbon disulphide. It is only to be expected that the degree of caking depends on the amount of sulphur taken up; a very large increase in weight occurs when the oxide is in use, and this increase in weight is not associated with any appreciable increase in volume of the bed, so that the sulphur formed in the box must be accommodated in the pores and voids in the mass. The question is whether different types of oxide material exhibit different capacities for accommodating the sulphur, so that some materials cake more than others; and further, whether some conditions of working differ from others in the effect on the caking of the same type of material.

It does appear to be true that some materials cake more than others under the same working conditions, and it is possible that study of the porosity, free space, and compressibility of the oxide mass may show significant variations which can be correlated with the degree of caking in use.

The number of variables in the working conditions is so large that great difficulty is experienced in endeavouring to study them separately. There does not appear to be any relation between caking and the tar or ammonia content of the oxide discharged. There are indications that caked oxide is distinguished by a low moisture content, but it is not yet clear whether the low moisture content is a sign that excessive drying of oxide in use causes caking in itself (for example, by the shrinking of the pores or the restriction of the active surface), or whether the drying is a sign that the caked oxide has suffered from excessive temperature rise during working. There is considerable fluctuation in gas temperature throughout the purifiers, as shown in Table 4; and further the temperature within the oxide mass is locally considerably higher than that of the gas leaving the box. The following table gives the results of observations made by inserting thermocouples in a bed of oxide 4 ft. deep, with downward flow of gas, in a set of four purifiers swung at intervals averaging seven days, the results quoted being those for the third cycle.

TABLE 9.—*Temperatures Within a Single 4 ft. Bed*

Position of box	No. of days after swinging	Temperature in bed °F. 6 in. from top	6 in. from bottom	Temperature of gas °F. Inlet box	Outlet box
1	1	81	122		
	2	84	132		
	3	70	120	82	79
	4	73	106		
	8	74	100		
	9	67	123		
2	1	57	71	77	72
	2	62	88		
3	3	52	62	73	67
4	2	59	60	68	59

It is seen that the temperature in the mass of oxide as first taker is considerably higher than the temperature of the gas measured in the inlet and outlet mains.

Another series of observations has been made with thermocouples installed in the two oxide layers of a split flow box with middle inlet, the box being swung every fifth day. The average results for the five months of its working life are summarized in the table below:

TABLE 10.—*Temperatures in a Split Flow Box*

Position of box	1	2	3	4	Mean
Temperature of gas °F.:					
Inlet main	75.2	70.4	73.0	71.8	72.6
Between beds	77.7	66.9	68.2	68.7	70.4
Outlet main	75.9	72.3	66.8	65.8	70.2
Temperature of oxide °F.:					
Average in top bed ...	83.1	76.8	71.8	72.5	76.1
Average in bottom bed	82.0	76.7	70.4	70.0	74.8
Temperature of air °F....	52.3	48.2	50.8	50.7	50.4

Variations in temperature at various depths of each bed were so small that it is fair to take an average for each bed, as is done in Table 10.

Although no quantitative comparison can be made between the results given in Tables 9 and 10, it is worth recording that the set where the temperature fluctuated widely (Table 9) habitually gave caked

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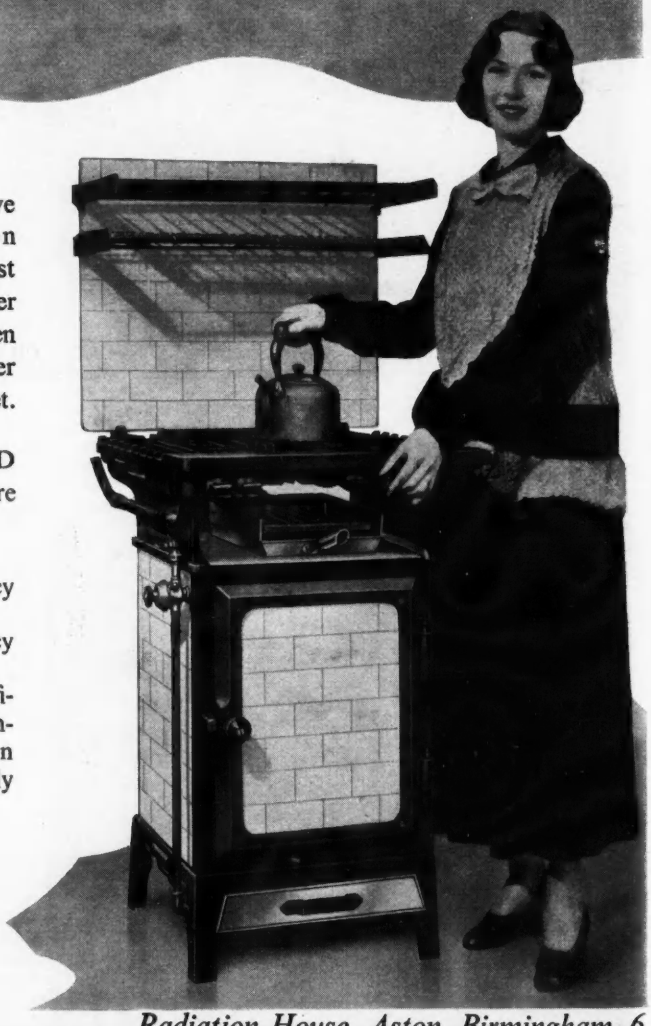

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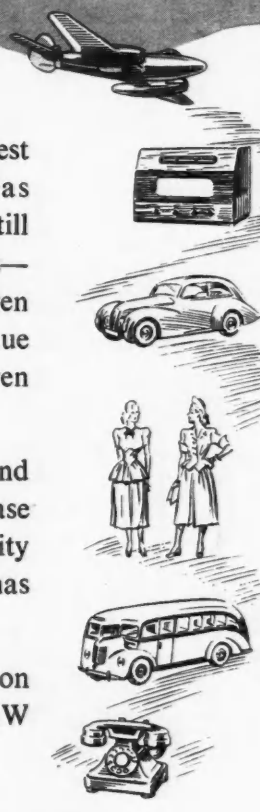

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(*See also* "JOURNAL" *Review on p.* 154)

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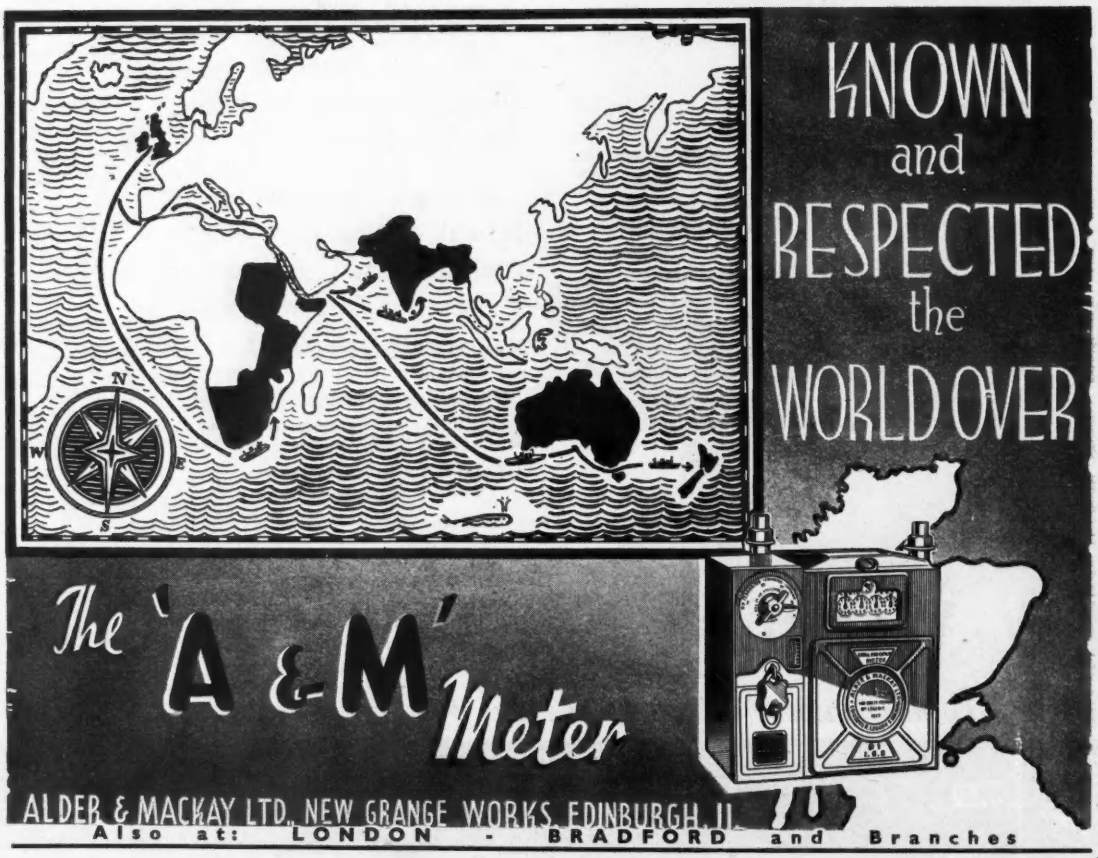

charges, while the set where the temperature was relatively steady (Table 10) did not usually suffer from caking.

It is difficult if not impossible, to differentiate the effect of moisture changes on caking from that of temperature fluctuations, or to control moisture changes in the oxide mass except by controlling temperature. A full scale test of the effects of temperature control by interstage air admission has been carried out by Dr. A. E. Haffner, and in view of the indication that they give of the effect of temperature on caking it is proposed to quote the principal results. The amount of air added at the inlet of each box is given in Tables 11 and 12.

TABLE 11.—*Interstage Air Admission to Boxes A, B, C, D*

	Oxygen added, % of gas					
Month, 1943	Feb.	Mar.	Apr.	May	June	July
Inlet first box	0.00	0.17	0.19	0.21	0.23	0.03
Inlet second box	0.51	0.33	0.45	0.24	0.12	0.25
Inlet third box	0.00	0.00	0.05	0.00	0.12	0.24
Inlet fourth box	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.51	0.50	0.69	0.45	0.47	0.52

TABLE 12.—*Interstage Air Admission to Boxes E, F, G, H*

	Oxygen added, % of gas					
Month, 1943	Feb.	Mar.	Apr.	May	June	July
Inlet first box	0.00	0.21	0.19	0.22	0.22	0.00
Inlet second box	0.51	0.35	0.36	0.33	0.15	0.21
Inlet third box	0.37	0.12	0.10	0.03	0.16	0.22
Inlet fourth box	0.00	0.00	0.00	0.00	0.00	0.01
Total	0.88	0.69	0.65	0.58	0.51	0.44

The temperature of the gas entering and leaving each box was read regularly. The largest variation in temperature within any one month for any of the boxes was 34° F., but this was exceptional, and in general the temperature of the gas leaving any box did not fluctuate more than 20° within the period of a month. The mean change in temperature of the gas in passing through each of the boxes is given in Table 13.

TABLE 13.—*Change in Temperature of Gas °F. in Passage Through Each Box*

Box	Feb.	Mar.	Apr.	May	June	July
A	+ 8	+10	+ 9	+13	+11	+ 9
B	+ 1	− 2	− 1	+ 1	0	+ 5
C	+ 1	0	+ 2	0	+ 2	+ 3
D	− 8	− 8	− 6	− 6	− 6	− 6
E	+ 8	+ 6	+ 2	+ 7	+ 7	+ 5
F	− 5	− 4	− 5	− 1	+ 1	0
G	0	0	+ 1	+ 1	− 1	0
H	− 3	− 2	+ 8	− 1	− 5	− 2

The above results do not relate to a single charge in each box, for the charges were changed as necessary at various times throughout the six months during which interstage air admission was practised. As boxes were discharged, the degree of caking was examined, with the following results:

TABLE 14.—*Analysis of Oxide*

Box	Date of charging In	Out	Analysis of oxide, % wet basis In Moisture	In Sulphur*	Out Moisture	Out Sulphur*	Caking
A	27.8.42	8.4.43	12	21	8	27	Top half severely
B	23.12.42	25.7.43	34	12	14	39	Little
C	17.1.42	28.1.43	18	29	14	51	Appreciable
D	6.11.42	15.6.43	27	30	22	41	Little
E	11.6.42	15.5.43	13	31	4	53	Top half severely
F	6.2.42	3.6.43	15	43	15	52	Appreciable
G	2.7.42	17.6.43	19	27	10	40	None
H	5.6.42	1.7.43	7	23	11	47	None

* Includes tar.

The charges examined from boxes C and F had therefore worked for some months without interstage air admission, and will not be considered further. The other six charges had worked almost all their lives under the influence of interstage air admission, and from their behaviour the following conclusions may be drawn:

(1) Boxes A and E are distinguished by a rise in temperature of the gas in its passage through the oxide. Both these charges were severely caked throughout the half near the gas inlet.

(2) Boxes B (except in July) and G suffered little change in gas temperature across the box. Box B was very lightly caked, box G not at all.

(3) Boxes D and H (except in April) are distinguished by a fall in temperature of the gas in its passage through the oxide. Box D was lightly caked, box H not at all.

Examination of the analysis for sulphur shows that these differences in caking are not to be ascribed to the amount of sulphur deposited in the box; for example, boxes A and E increased less in sulphur content than boxes B and H.

It therefore seems probable that moisture and temperature changes play a part in the phenomenon of caking. Whether this is due to changes in the physical properties of the oxide, or to the manner in which the sulphur is formed in the mass, has yet to be established. It is found that there is wide variation in the appearance of spent oxide, both as regards the size of the sulphur crystals and the extent to which the oxide surface is covered by sulphur. It is possible that solvents such as light oils may play a part in the phenomenon of caking. These theories are being examined in the laboratory and on the works. Until the results of this study are available it is recommended that material containing much clay or very finely divided oxide should be avoided, and that shavings or peat be added where caking is experienced. Fluctuations in temperature and moisture should be minimized so far as possible, and boxes should be swung regularly and frequently, and charges not left in for excessively long periods.

It is desired to thank the Directors of the Gas Light and Coke Company for permission to publish this paper.

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A CENTURY OF SERVICE

FIRST recorded use of gas in Toronto was in 1841. Seven years later, the Consumers' Gas Company of Toronto was formed and from that date there has been a 100 years' uninterrupted supply. The Toronto Gas Light & Water Company was formed in 1841, but discontent resulted finally in a public meeting on Sept. 17, 1847, where it was decided to start a new gas company, financed by the citizens at large and operated for their benefit. Many subsequent meetings were held and, as the minutes record, were "respectably and numerously attended." The new Consumers' Gas Company was pledged to make "a constant supply of wholesome gas at a reasonable rate."

Early plans to build a new works were changed and the old gas-works was purchased and improved. Production increased by one-sixth (about 4,000 cu.ft. a day) but the price of gas remained at 25s. per 1,000 cu.ft. With the directors often adding personal funds, work continued and the first dividend was paid early in 1849. In 1850 there was a profit of £670. Eight miles of mains had been laid. From then to 1857, progress was phenomenal with production reaching 65 million cu.ft., ten times the 1850 figure. The depression of 1857-1866 hit the gas company as it did all business in Toronto. Annual production dropped to 27 million from its 65 million peak. But under the direction of President E. F. Whittemore, who had succeeded Charles Berczy in 1856, and Manager Henry Thomson, the Company held its own financially.

In 1867, the year President Richard Yates died after serving for eight terms, the new President, E. H. Rutherford, was able to announce recovery from the oil scare and the depression with a most satisfactory financial report. By 1873, the 25th anniversary, with Manager H. Thomson still in charge, the Company had received permission to increase its capital from $400,000 to $1,000,000 for a large expansion programme. There were now 2,050 customers and annual production was up to 72 million cu.ft., twelve times the amount of the charter year.

Annual gas production had increased by 1898 to an amazing figure, 100 times the output of the year when the Consumers' Gas Company bought the old works. By the start of the first world war, further growth had been experienced. At the end of the war, the problems of short supplies, high wages, high costs and growing taxes were exceptionally difficult. But satisfactory progress was still made. New industrial uses for gas recovered the loss when munition plants stopped turning out shells. Because of the tight supply position, some new business had to be declined.

The Company celebrated its 75th anniversary in 1923 and was able to show that despite increases in the price of gas caused by war-wrought difficulties, sales had expanded greatly. During the depression of the 'thirties, the Company embarked on large main laying projects to the suburbs in an effort to combat unemployment. The weight of heavy taxes, slipping sales, and generally disturbed economic conditions somewhat broke the rapid stride of progress. But in 1934, the annual report noted that the severest financial strain in the Company's 86-year history had been withstood and sales were better.

In the 1939-45 war, every war industry in the Company's area had an adequate supply of gas. Of 240 employees who enlisted, it is recorded that eight lost their lives. When war production demands ceased, new post-war demands took their place and regular increases in production have continued. In the supper hour alone of any single winter day now, gas production is equal to the amount made in a full year in the early years. A maximum day's output now is 32½ million cu.ft.—about six times the production of the entire year 1848.

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Ever since 1913 "PERMAC," the original Metal-to-Metal Jointing, has been holding up difficult joints in Gas Works and on Coke Oven Plants all over the world. Equally suitable for any joint—steam, water, gas, oil, benzol, ammonia, etc.—screw pipe or flange.

Manufactured only by

THOMAS & BISHOP LTD.
39 ARTHUR ROAD, LONDON, S.W.19

Sulphur Recovery in the United States

Simon-Carves, Ltd., of Cheadle Heath, Stockport, have an arrangement with Messrs. E. C. Badger & Sons Company, U.S.A., under which the latter can manufacture Simon-Carves sulphur recovery plants in the United States. The first plant to be built by Messrs. Badger in America under this arrangement will be for the Hancock Chemical Company, a subsidiary of the Hancock Oil Company of Long Beach, California. The reason for the conception of this plant is the elimination of atmospheric pollution. Very stringent regulations are in force in Los Angeles regarding the amount of hydrogen sulphide and sulphur dioxide that may be emitted into the atmosphere from any plant operation, and several refineries which have previously burnt their waste gases containing a substantial amount of H_2S are compelled to take steps to abolish this nuisance. They are now scrubbing out the H_2S by various methods and selling stripped hydrogen sulphide gas to the Hancock Chemical Company, who will convert it into sulphur in a Simon-Carves sulphur recovery plant.

* * *

A Springtime Display

Frolicking lambs on a grass mound studded with real primroses were included

in this striking interior "Springtime" display by the Newcastle and Gateshead Gas Company to link up with their showroom windows.

GAS STOCKS AND SHARES

The week opened with a general fall in industrial shares owing to the continued effect of the proposed levy on investment income and the adverse influence of international politics. A steady stream of selling had followed the Budget announcement of the levy, and increased selling of British Government securities also resulted in a heavy fall. Later in the week there was a steady and sustained recovery in prices, and the Chancellor's reassurances that the levy was to be "once for all" brought about a better tone all round. A rally in British funds that began on Wednesday was consolidated, and price changes in the industrial market, though small, were nearly all in favour of holders.

There was a remarkable increase in turnover in the gas stock market the week's bargains on the London Stock Exchange reaching a total of 514, the highest for a very long time. With the exception of Cape Town, which, on an ex-dividend basis showed a fall of 6d. compared with the previous week, all the price changes were in an upward direction. Imperial Continental, Montevideo, and Primitiva were among the undertakings whose securities advanced during the week, and there was a general increase of interest in the holding companies

The week's rises and falls were as follows:

OFFICIAL LIST

Barnet, ord. 7 p.c. max.	153	—158	+ 1
Bath, cons. ord. 5 p.c. Basic	103	—108	+ 3
Bournemouth, 6 p.c. pref.	123	—128	+ 1
Cape Town, 4½ p.c. cum. pref. (xd. Apr. 4)	16/6	— 18/6	— 6d.
Cardiff, cons. ord.	118	—123	+ 1
Cheltenh.m, 5p.c. basic cons. ord.	100	—105	+ 1
Chester United, ord.	106	—111	+ 1
Derby 4 p.c. red. deb.	93	— 98	+ 1
East Hull, ord.	92	— 97	+ 2
East Surrey "B" 5 p.c.	98	—103	+ 1
Do 6 p.c. cum. pref.	117	—122	+ 2
Do. 5 p.c. irred. deb.	118	—123	+ 1
East Wight, cons. ord.	108	—113	+ 1
Eastbourne, "A"	97	—102	+ 2
Gas Consolidation, ord. "A"	21/	— 23/	+ 6d.
Do. ord. "B"	21/11	— 23/	+ 6d
Gas Light & Coke, ord.	23/	— 24/	+ 6d.
Do. 3½ p.c. red. deb.	93	— 98	+ 1
Gloucester, cons. ord.	94	— 99	+ 1
Guildford, cons. ord.	132	—137	+ 5
Hastings & St. L., 5 p.c. std.	98	—103	+ 3
Do. 3½ p.c. std.	82	— 87	— 5
Hornsey, 3½ p.c. std.	89	— 94	+ 2
Do. 5 p.c. std.	110	—115	+ 3
Imperial Continental, cap.	125	—130	+ 1
Lea Bridge, cons. ord.	132	—137	+ 3
Luton, cons. ord. "A"	148	—153	+ 3
Do. ord. "B"	115	—120	+ 5
Mid-Southern Utility, "A" cons.	100	—105	+ 1
Do. "C" cons.	102	—107	+ 2
Do. 4 p.c. cons. pref.	96	—101	+ 1
Montevideo. Ltd., ord.	122	—127	+ 2
Newcastle & Gateshead, 3½ p.c. perp. deb.	93	— 98	+ 1
Newport (Mon.), cons.	93	— 98	+ 1
Do. 5 p.c. perp. deb.	112	—117	+ 2
North Middlesex, 6 p.c.	122	—127	+ 5
Northampton, cons.	103	—108	+ 1
Oxford, cons. ord.	200	—210	+ 2
Plymouth & Stonehouse, 5 p.c. deb. perp.	118	—123	+ 1
Portsmouth & Gosport, cons.	144	—149	+ 1
Do. 5 p.c. max.	100	—105	+ 3
Preston, "A"	172	—182	+ 2
Primitiva Holdings, ord.	12/6	— 14/6	+ 6d.
Reading, 5 p.c. max.	97	—102	+ 3
Do. 3¾ p.c. red. non. cum. pref.	94	— 99	+ 2
Romford, ord.	110	—115	+ 3
Severn Valley, 4½ p.c. cum. pref.	20/6	— 21/6	+ 3d.
Sheffield, 4 p.c. red. deb.	94	— 99	+ 2
South Eastern, ord.	21/9	— 22/9	+ 3d.
Do. 4½ p.c. red cum. pref.	20/9	— 21/9	+ 3d.
South Metropolitan, ord.	98	—101	+ 1
Southampton, ord.	101	—105	+ 1
Sunderland, ord.	113	—118	+ 3
Swansea ord.	82	— 89	+ 2
Do. 5½ p.c. red. pref.	100	—105	+ 2
Swindon, cons. ord.	113	—118	+ 4
United Kingdom, ord.	23/	— 24/	+ 3d

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"LYNDON" and "EGA-KUT"
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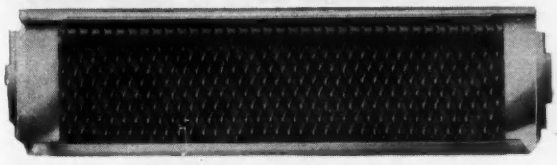
CHROME GRILL DEFLECTORS



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For all types of gas cookers.

These deflectors become incandescent in 40-60 seconds, remain free from rust, and thus prevents contamination of food.

The cross strand formation eliminates hot spots, warping and cracking. Laboratory tests have given 3700 heat hours on alternate heating and cooling.

Made from Firth-Vickers F.I. 20 heat resisting chrome steel.

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SEE OUR STAND NO. D404 B.I.F. BIRMINGHAM MAY 3-14

GEO. W. KING LTD.

Makers of Electric Pulley Blocks. Cranes and Conveyors Write for illustrated booklets.

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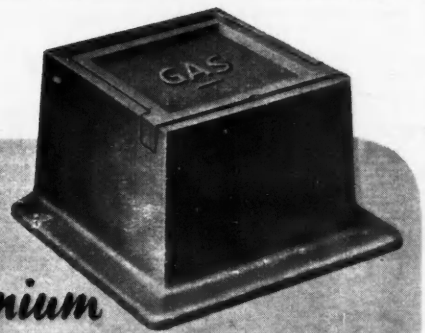

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FLEXIBLE — Seven interchangeable flame units providing infinitely variable range of flame lengths and temperatures from moderate to very high.
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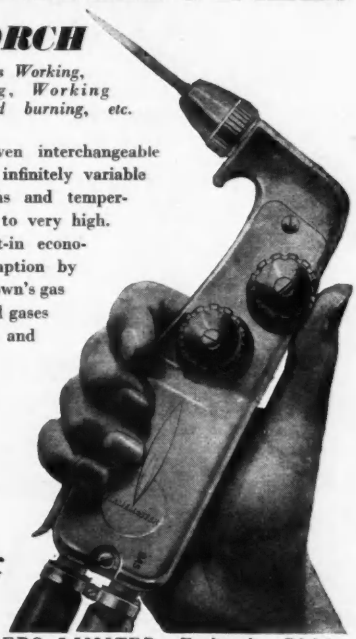

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Streamlined modern design, cast iron construction and many other special features—notably economical consumption of gas.

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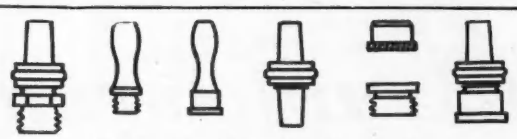

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OF BEST QUALITY AT REASONABLE PRICES
OUR RANGE OF FITTINGS IS NOT COMPLETE BUT IT IS BEING EXTENDED THOSE INCLUDED ARE AVAILABLE FOR
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OLDBURY · BIRMINGHAM

RETORTS MADE GAS TIGHT
when patched with—

ONX SUPER 83 BRAND FIRE CEMENT

A recent Testimonial from Gas Dept.
"We are pleased with results obtained after using ONX Super '83' Brand. "Our settings were very bad, with large cracks in retorts, and portions of wall actually collapsed. "Now, six months after repairing 28 retorts they appear as sound as ever; we anticipate the life of the settings will be prolonged."

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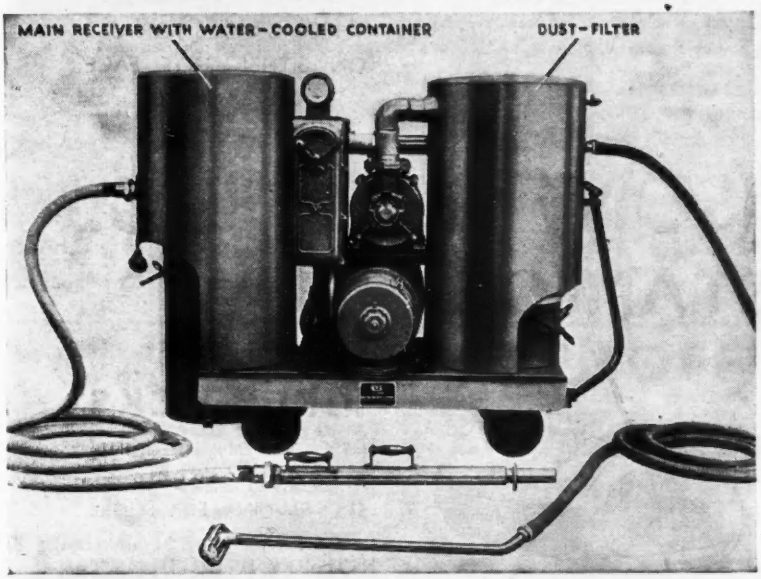
THE B.V.C DUAL-PURPOSE GAS WORKS MODEL



The B.V.C. Dual-Purpose Gas Works Model is a very efficient mobile unit, with water-cooled container for the removal of hot dust from the tops of retorts. Can be used for general cleaning by either one or two operators.

We shall be pleased to send you full information on request.

B.V.C. Flue Dust Removal Plant Equipment is used by: The Gas Light & Coke Co. (Beckton, Nine Elms, Southall and Brentford). The Birmingham Corporation Gas Co. The Cardiff Gas Co. The Birkenhead Gas Department. The Commercial Gas Co. The Reading Gas Co., etc., etc.

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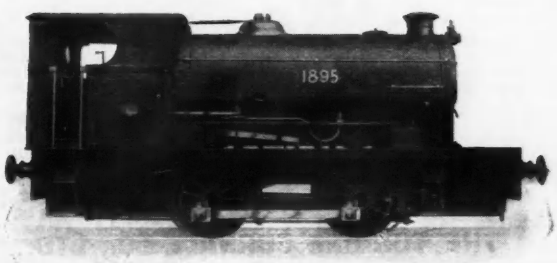

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FIRECLAY AND SILICEOUS WHOLEPIECE AND SEGMENTAL TO GAS ENGINEERS' SPECIFICATION

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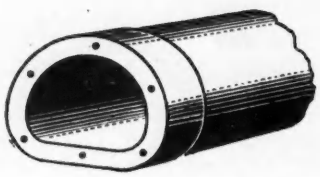

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42% ALUMINA FOR SEVERE CONDITIONS

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The call has gone out to the Country for increased production. We guarantee to increase the steam output of your boilers and keep your fuel costs down to a minimum. Turbine Patent Furnaces are efficient on all types of boilers. We shall be glad to assist in your steam raising problems.

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THE WORLD'S FINEST FIRE-PROOF NON-CONDUCTING material for

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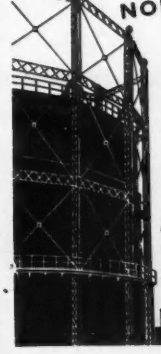

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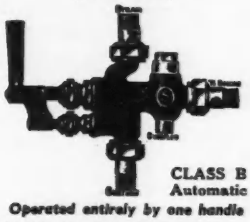

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AIR RECEIVER, 18 ft. 6 in. by 4 ft., 100 lb. Broom & Wade TWIN COMPRESSOR, Type D21.

Cylindrical ENCLOSED TANK, 30 ft. by 7 ft.

34 KW. STEAM GENERATING SET, 220 volts D.C.

Robey H.S. VERTICAL STEAM ENGINE, 9 in. by 7 in.

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Weir type VERTICAL FEED PUMP, 2,000 g.p.h.

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COMPANY with patents and designs for domestic gas appliances require further capital. Orders booked throughout the country. Jig and tooling and manufacturing organization complete. Capital required £2,500-£4,000. Active or non-active partner will be considered. Replies to No. 9727, "GAS JOURNAL," 11, Bolt Court, Fleet Street, London, E.C.4.

MONOMARK SERVICE. Permanent London address. Letters redirected immediately. Confidential. 5s. per annum. Royal patronage. Write MONOMARK, BCM/MONO5H, W.C.1.

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TENDERS are invited for RESETTING one bed of eight horizontal 20 ft. THROUGH RETORTS from charging floor level with materials supplied from the Gas Department's stock.

Further particulars may be obtained from Mr. B. Hudson, Gas Engineer, The Gas-works, Pontefract.

Tenders should be sent in plain sealed envelopes (without any name or mark indicating the sender), endorsed "Gas Retorts," to reach the undersigned not later than May 5, 1948.

J. F. ROOK,
Town Clerk.

Municipal Offices,
Pontefract.

CITY OF MANCHESTER
(GAS DEPARTMENT.)

THE Gas Committee invites tenders for the works and materials required in CLEANING AND PAINTING of Nos. 6 and 7 Gasholders situated at the Newtown Gasholder Station of the Rochdale Road Works.

Specification and form of tender may be obtained on application to the Commercial Manager and Secretary, Gas Department, Town Hall, Manchester, 2.

Sealed tenders in the envelope provided, addressed to the Chairman of the Gas Committee and endorsed "Painting Gasholders," must be delivered at the Gas Office, Town Hall, Manchester, 2, not later than 10 a.m. on Friday, April 30, 1948.

The Committee does not bind itself to accept the lowest or any tender.

PHILIP B. DINGLE,
Town Clerk.

Town Hall,
Manchester, 2.
April, 1948.

APPOINTMENTS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50, inclusive, or a woman between the ages of 18 and 40, inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1947, or the vacancy is for employment excepted from the provisions of that Order.

WANTED. Gentleman calling on Gas Companies to represent firm with specialities. On commission. Car essential. Every support. Apply to No. 9726, "GAS JOURNAL," 11, Bolt Court, Fleet Street, London, E.C.4.

FIRST-CLASS REPRESENTATIVE required for North of England and Scotland to market gas appliances for established company. Salary, commission and expenses. Write, giving full details of previous experience, to No. 9725, "GAS JOURNAL," 11, Bolt Court, Fleet Street, London, E.C.4.

CORK GAS WORKS
CHIEF ENGINEER AND MANAGER.

THE Cork Gas Consumers' Company invites applications for the position of CHIEF ENGINEER AND MANAGER of their works.

Applicants must possess recognized professional qualifications and be fully experienced both in production and distribution of gas.

Commencing salary £1,100 a year and free house.

Applications are to be submitted on the prescribed form (obtainable from the Secretary) and must be posted so as to reach the Secretary not later than May 22, 1948.

All communications in this matter will be treated as confidential.

S. DOYLE,
Secretary.

Cork Gas Consumers' Company,
72, South Mall, Cork.
April 10, 1948.

BRISTOL GAS COMPANY
WORKS TECHNICAL ASSISTANT.

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at a commencing inclusive salary of £425 per annum.

Candidates should possess a Certificate of the Institution of Gas Engineers, preferably in Higher Grade (Manufacture) and/or should have experience in the control and operation of vertical and horizontal retorts, carburetted water gas plants and be capable of supervising all other manufacturing processes.

Candidates should not be more than 35 years of age, and the selected candidate will be required to pass a medical examination and contribute towards the Company's superannuation scheme.

A modern flat at reasonable rent is available.

Applications, endorsed "Technical Assistant," giving full details of age, training, qualifications and experience, together with *copies* of not more than two recent Testimonials, to be sent to the undersigned not later than Monday, May 3, 1948.

JAMES CARR,
Engineer and General Manager.

Bristol Gas Company,
Radiant House, Bristol, 1.
April 8, 1948.

ROYAL BURGH OF DUMFRIES
(GAS DEPARTMENT.)
ASSISTANT ENGINEER AND MANAGER.

APPLICATIONS are invited for the above post.

Applicants should have experience of gas manufacture, gas testing and distribution, and be fully conversant with Tully or water gas and other ancillary gas-works plant.

Possession of the Higher Grade Certificate of the Institution of Gas Engineers in Gas Engineering (Manufacture) is desirable.

The appointment is subject to the provisions of the Local Government Superannuation (Scotland) Act, 1937, and the successful candidate will require to pass a medical examination.

The salary offered will be in accordance with the J.I.C. Scale of Salaries, A.P.T. Division, Grade II, which is £360, rising to £405, with cost of living increase (at present £60 per annum).

Applications, with *copies* of three recent Testimonials, should be lodged with S. C. Johnstone, Engineer and Manager, Dumfries Corporation Gasworks, Cumberland Street, Dumfries, on or before Thursday, May 6, 1948.

J. HUTCHEON,
Town Clerk.

Municipal Chambers, Dumfries.
April, 1948.

CARBONIZING SUPERINTENDENT required for 350 millions works in Midlands. Applicant must be fully experienced in control of continuous vertical retort settings and C.W.G. plant. Full particulars of age, experience and present engagement should be sent to the undersigned.

THOS. WATSON,
Engineer and General Manager.

The Rushden District Gas Company,
Rushden,
Northants.

THE Liverpool Gas Company invites applications from qualified DRAUGHTSMEN for a position in the Drawing Office of the Distributing Engineer. Applicants should preferably be not more than 28 years of age and should have had experience in mechanical or civil engineering. Some knowledge of underground mains systems would be an advantage.

Remuneration will be in accordance with the Company's established salary scales within the grade £315 to £405 per annum.

The successful applicant will be required to pass the usual pre-employment medical examination and to contribute to the officials' superannuation fund.

Application should be made by letter addressed to the PERSONNEL SUPERINTENDENT 18-26, Bold Street, Liverpool, 1.

April 13, 1948.

An exemption certificate from the Ministry of Labour is held for this advertisement dated April 8, and is valid until June 7, 1948.

BRISTOL GAS COMPANY
CHIEF FOREMAN, MAINS DEPARTMENT.

APPLICATIONS are invited for the above position. Applicants should have a thorough practical and theoretical knowledge of high and low pressure main and service laying. Ability to organize and control labour is essential.

If desired, a modern flat is available at reasonable rental.

Salary £420 per annum inclusive.

Applications, stating age, training, experience and qualifications, together with *copies* of two recent Testimonials, should be sent to the undersigned not later than April 30, 1948.

This advertisement is inserted by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.

JAMES CARR,
Engineer and General Manager.

Radiant House,
Bristol, 1.

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A. R. MYHILL. 12/6 post free (Quotations for 12 copies and over)

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R. J. RESTALL. 10/6 post free

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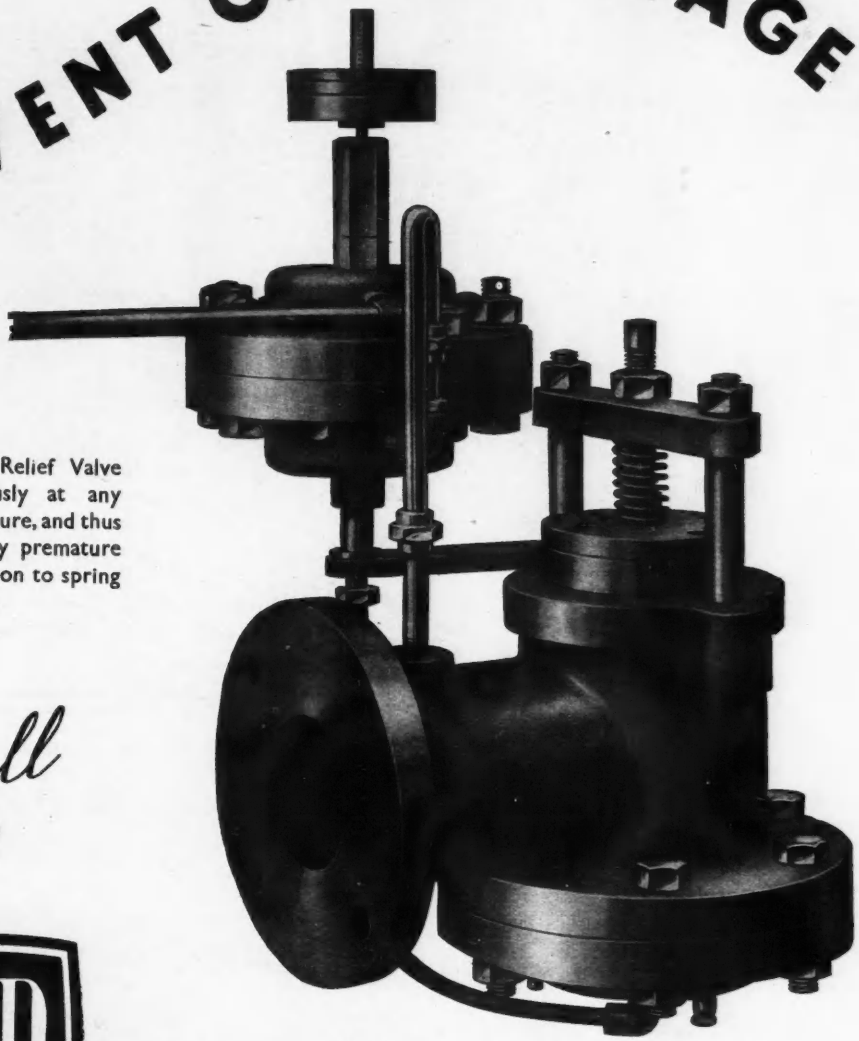

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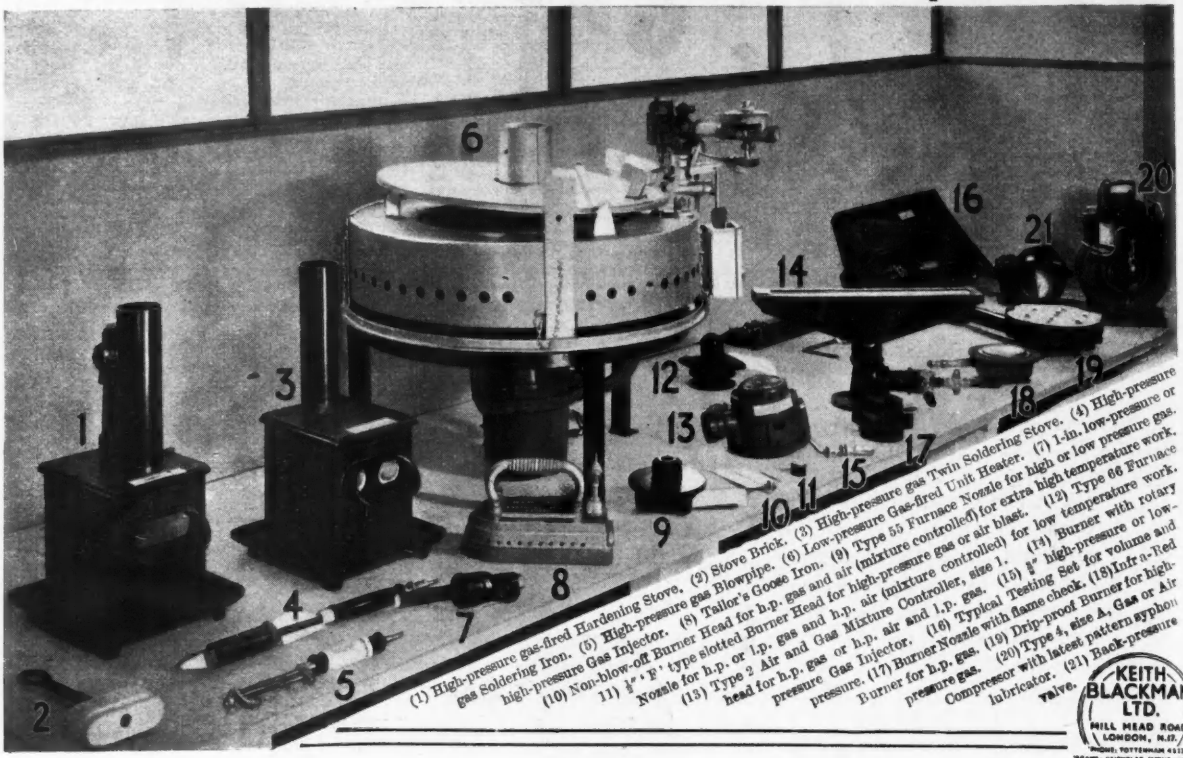

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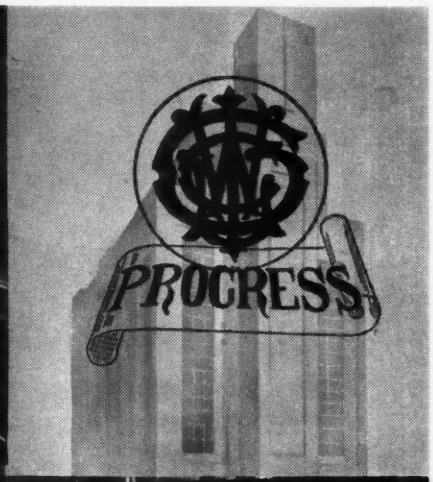

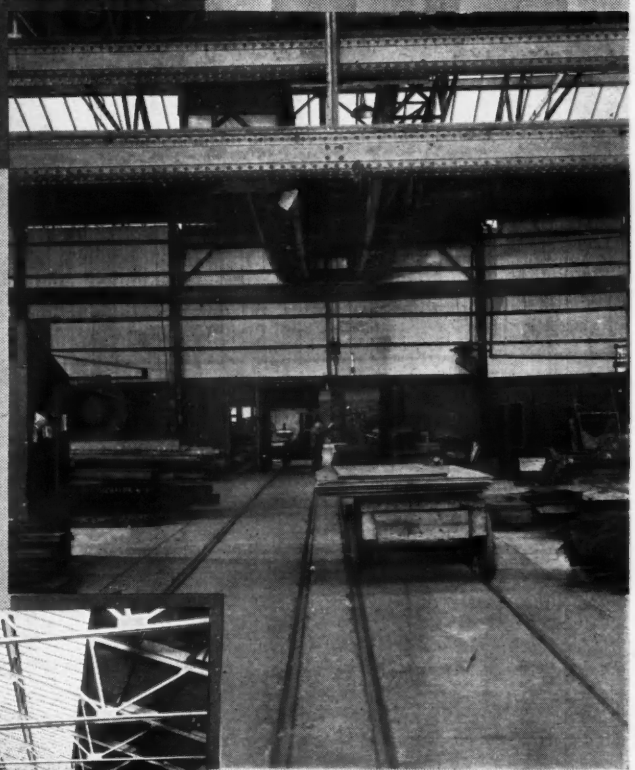

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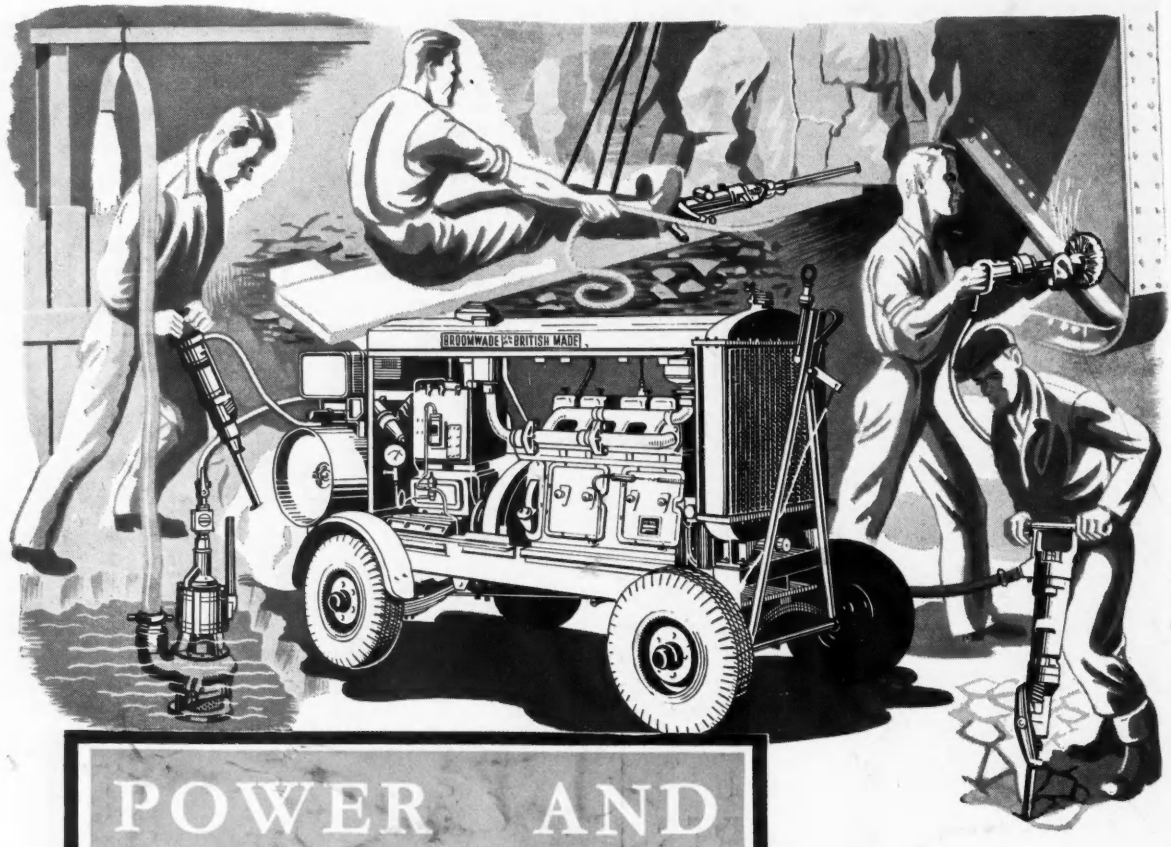

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